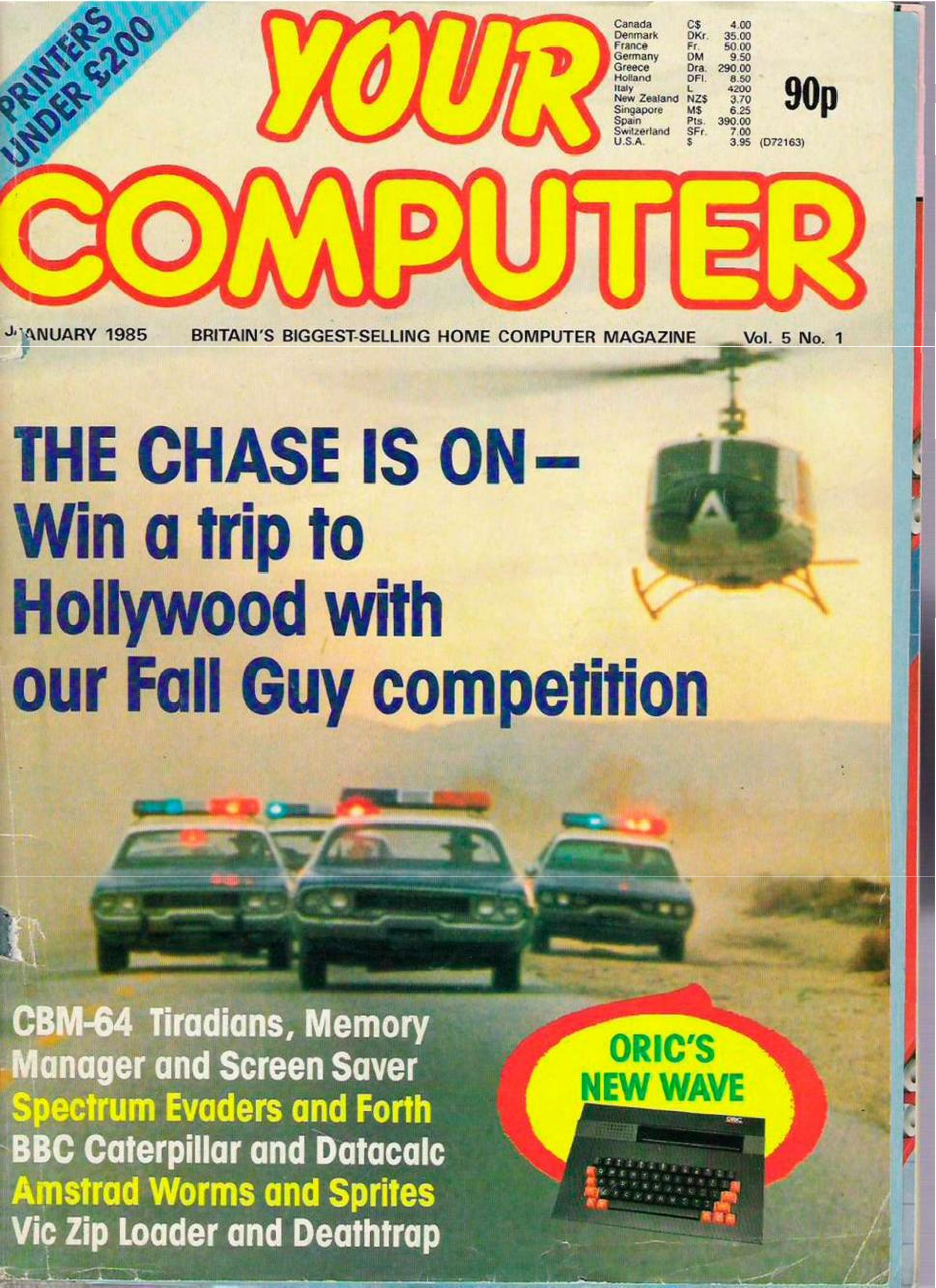

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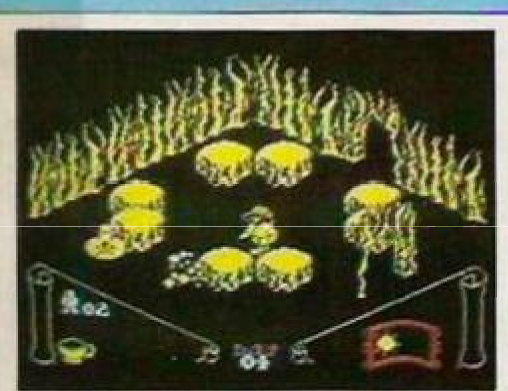


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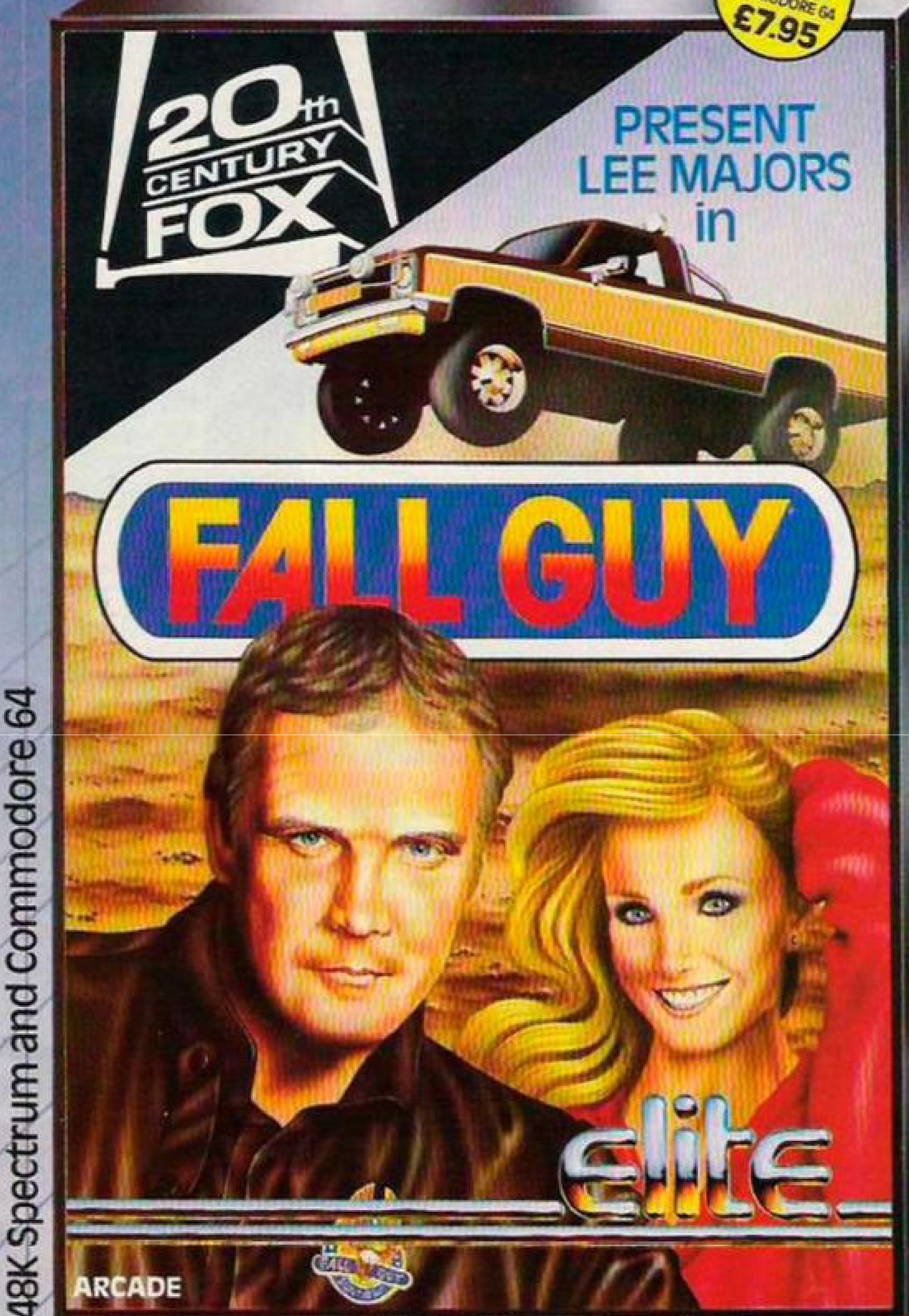
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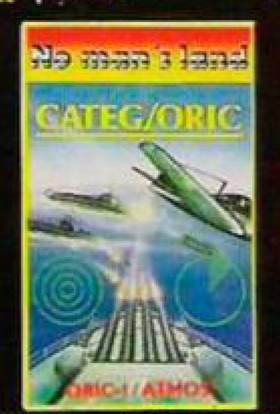
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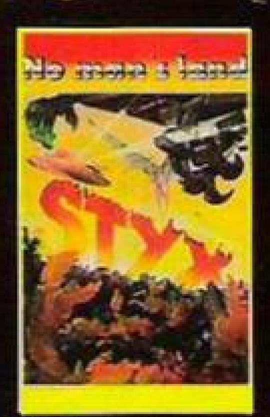
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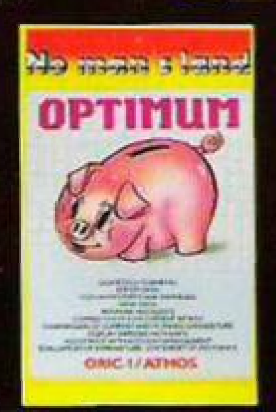
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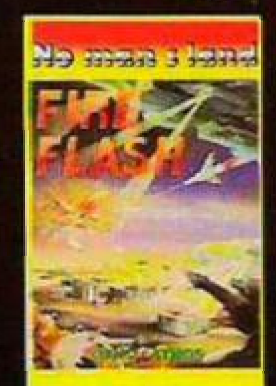
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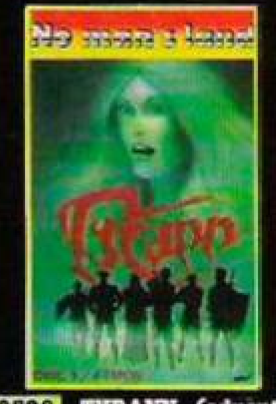
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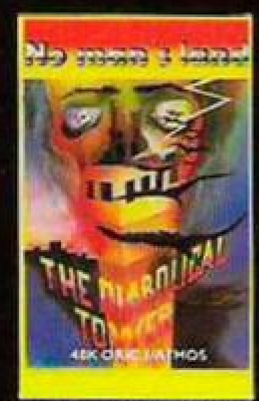
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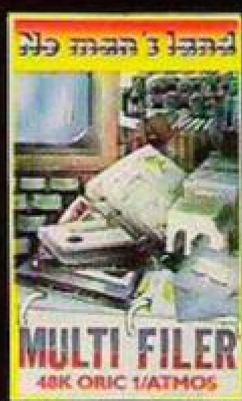
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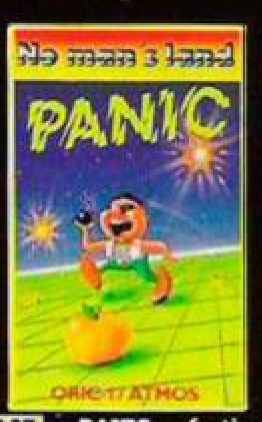
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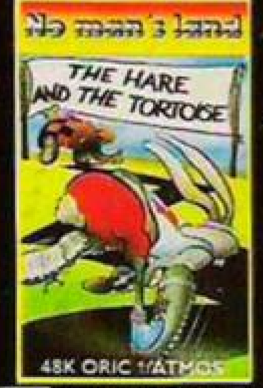
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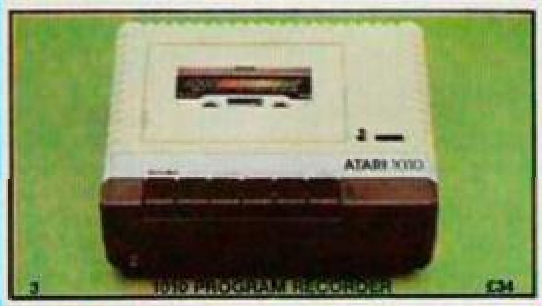
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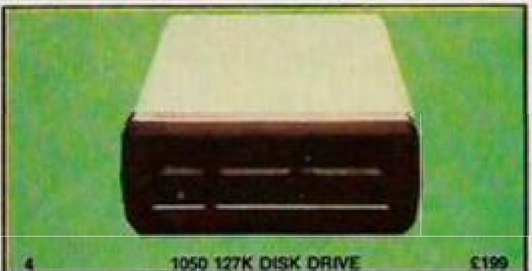
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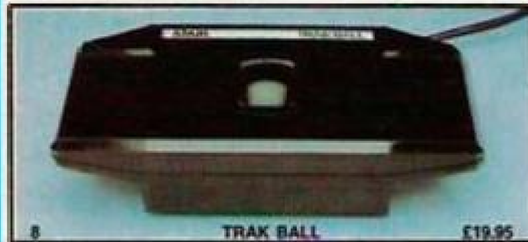














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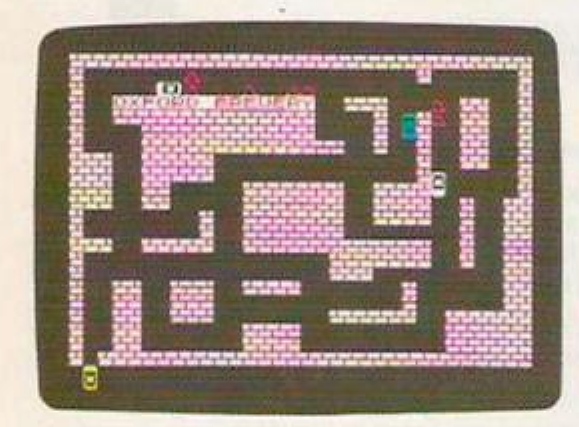
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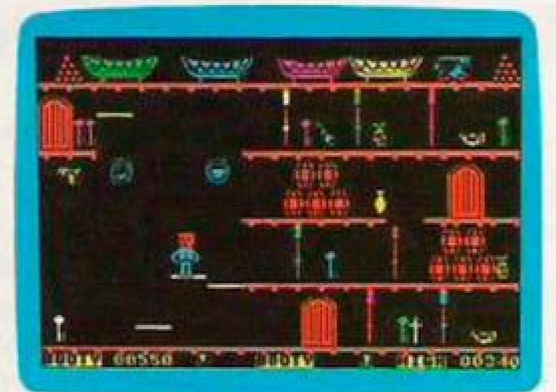
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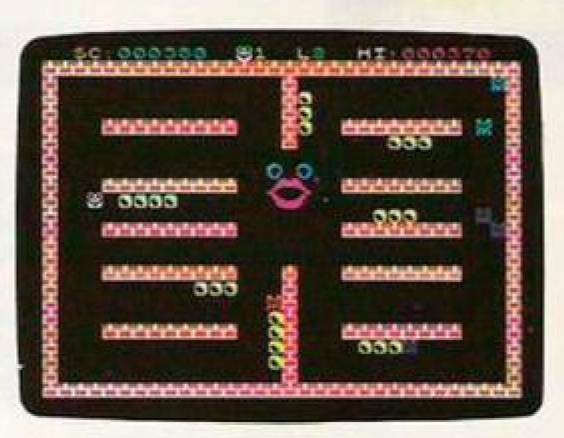
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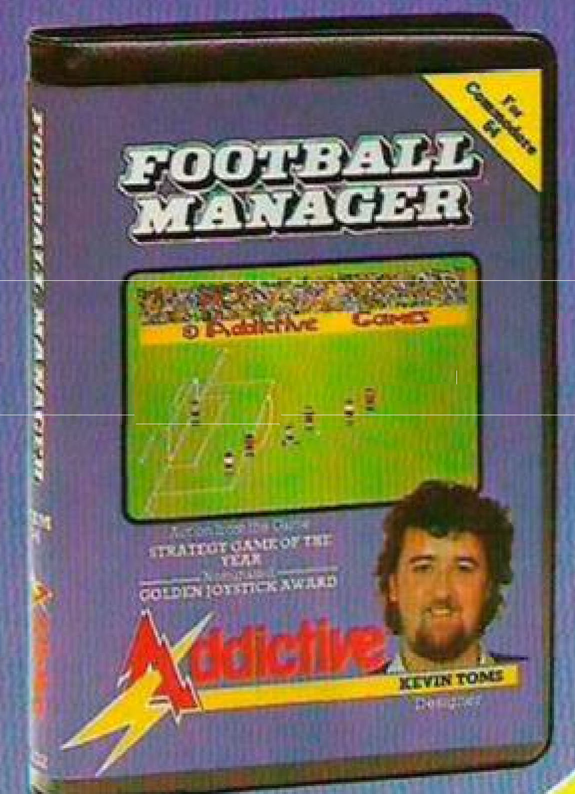
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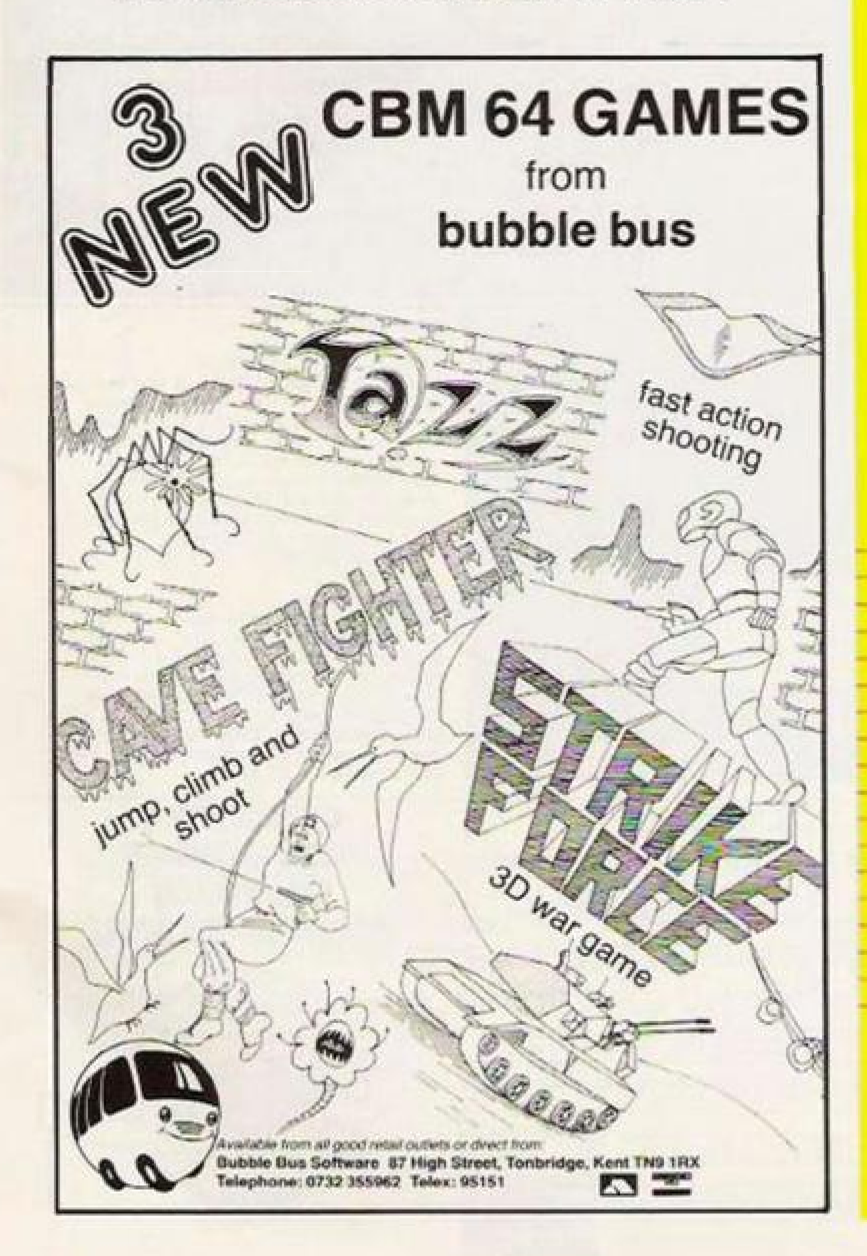
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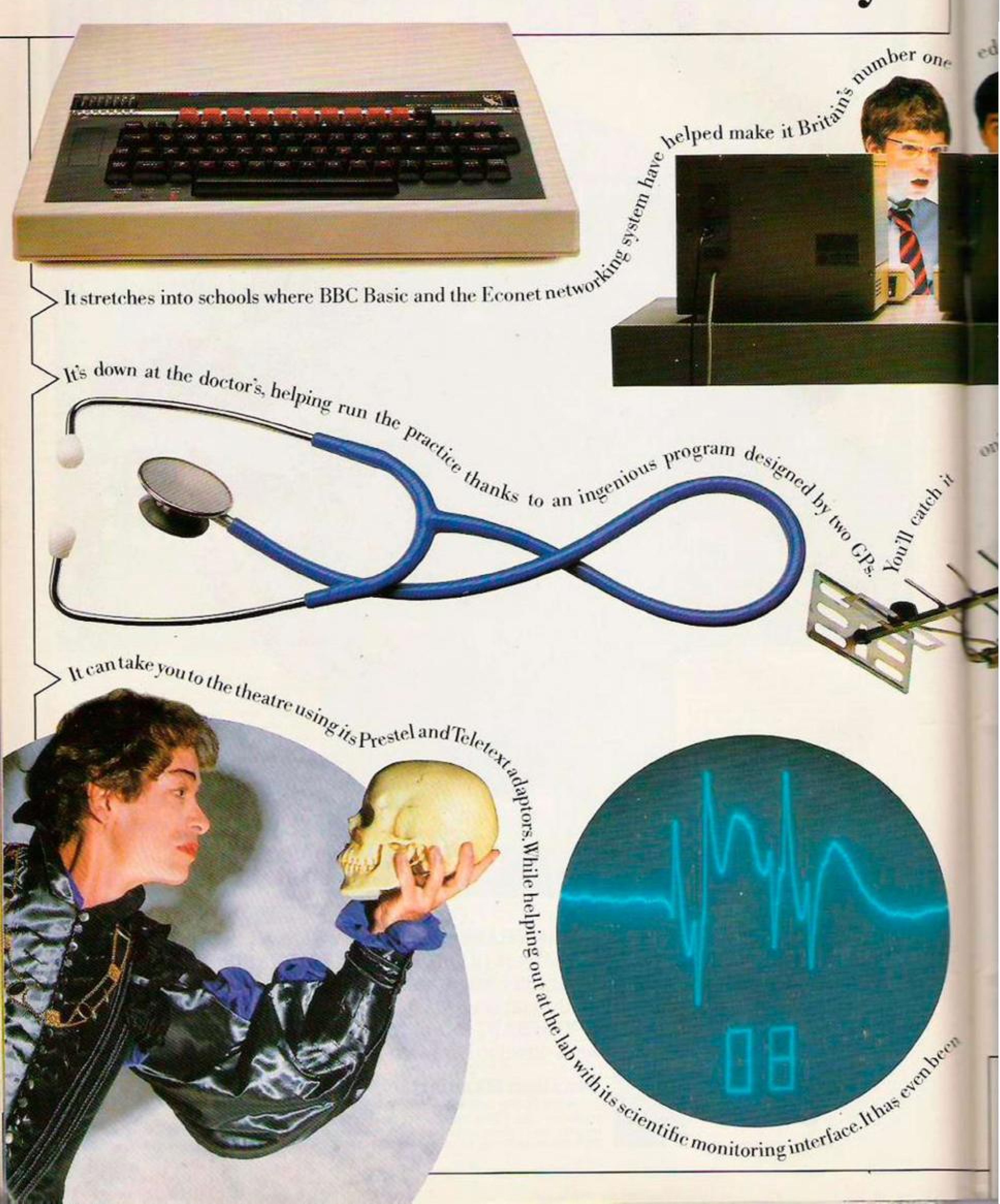
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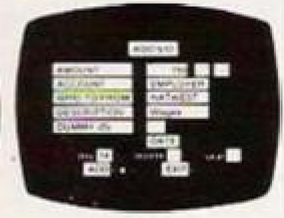



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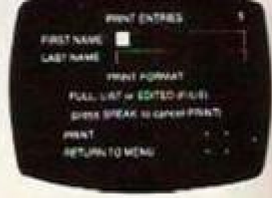
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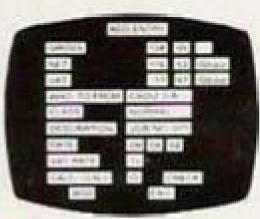
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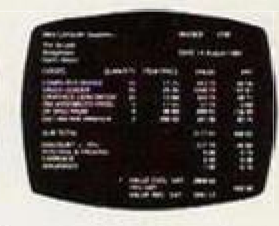












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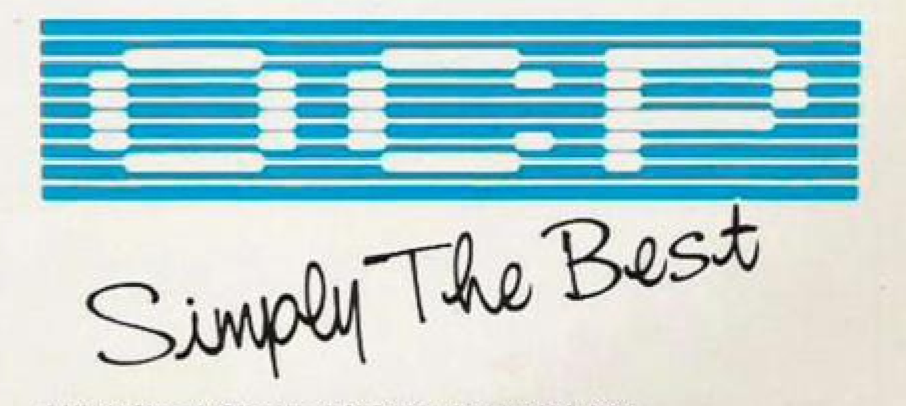
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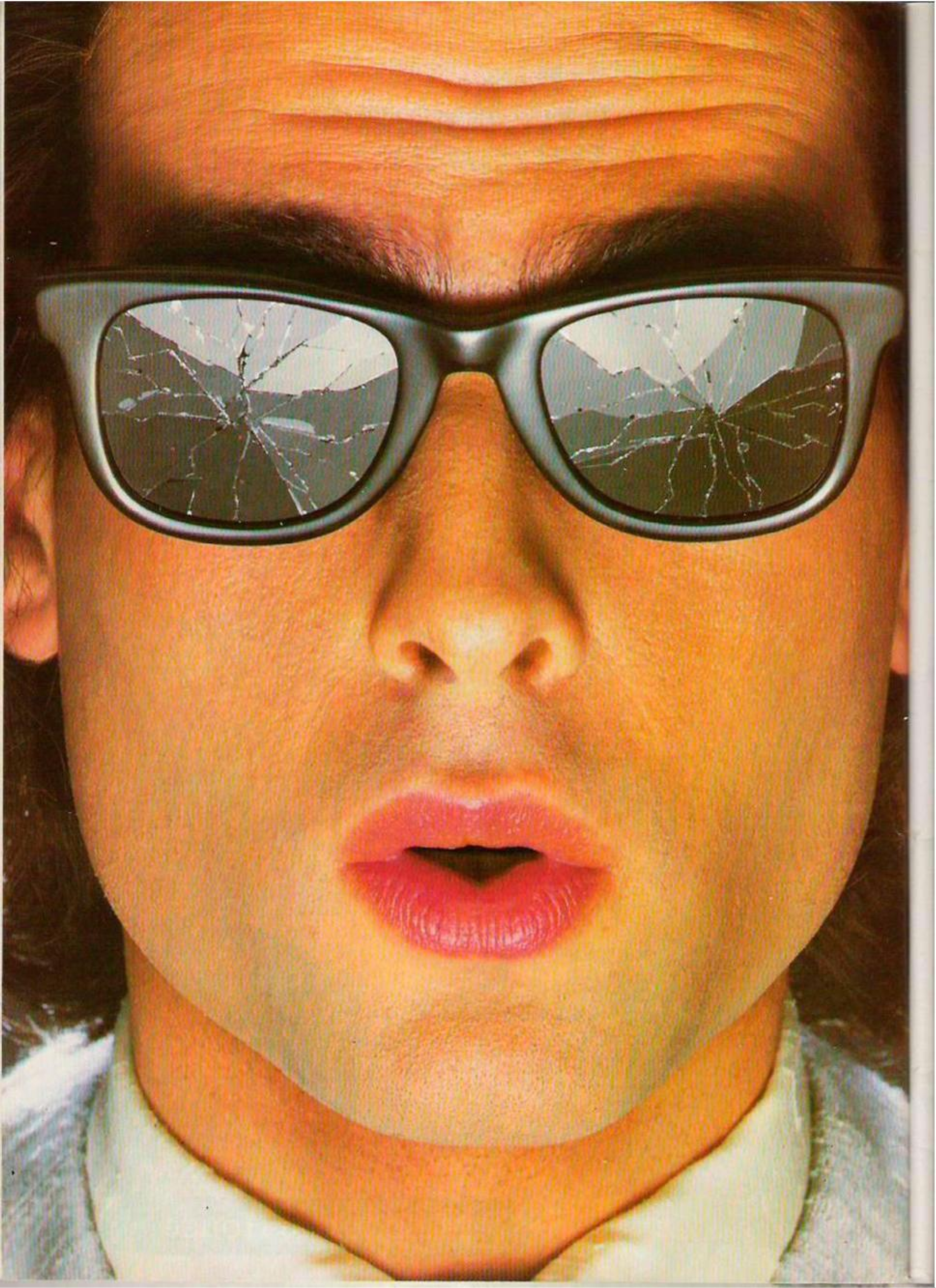
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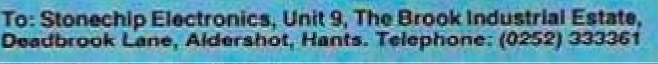


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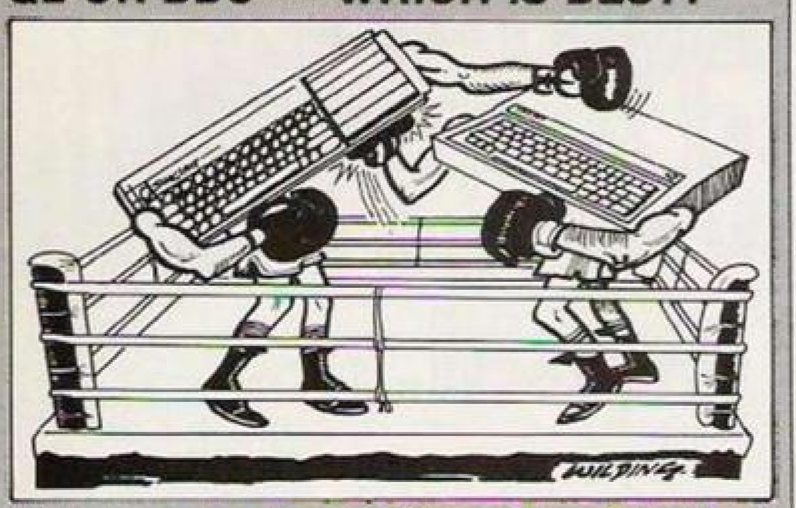
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QL OR BBC — WHICH IS BEST?



I was most interested to read Stephen Corcoran's "unbiased" comparison of the QL and BBC microcomputers. Although some of his criticisms of the QL are undoubtedly valid, he spoils his case by comparing the bare QL with a BBC availed of at least a thousand pounds worth of enhancements!

The fact of the matter is, that for a mere £400 the QL has 88K of memory directly accessible from Basic, a maximum screen resolution of 512 by 256 which uses none of that 88K, and graphics which are at least four times faster than a BBC. How can the QL's fiercest critics deny the outstanding technical achievement this represents?

The thing which amuses me about all the uninformed arguments against the QL is that most of them fail to spot the thing which irritates the actual users most; that is, the present dire shortage of software for the machine. At present the only software you can get for the thing is system software, ie., languages such as Forth, Pascal, BCPL etc! Although this is certain to change soon, it does mean that at the moment there are very valid reasons for people to prefer a BBC micro to a QL.

Just because I like the QL doesn't mean I have to think there is anything particularly wrong with the BBC — far from it. To a large extent the choice between them is just a matter of taste. Does one stick to proven, reliable, established technology, or would one rather take a risk with something new and more powerful?

But remember the early days of the BBC micro, when it was new and untried, and most of its expansion options were just so much advertising copy? Where would the BBC micro be today if many of the current owners hadn't taken the same risk?

Stephen R. Hill,
Boston, Lincolnshire.

BASICALLY BAD

In the November issue of *Your Computer* Mr Sharpey — Sharpey-Schafer I suspect — launched a tirade against those who criticise the widespread use of Basic and the consequential sloppy programming techniques that can result from its uncritical use. Mr Sharpey's own letter is itself a salutary example of the very sloppiness that Basic seems to engender.

Mr Sharpey argues that the popularity of Basic on home micros testifies to its superiority. Had Mr Sharpey researched the matter properly he would have realised that Basic isn't popular by choice, but only because that is what is supplied by manufacturers as the native programming language, largely because interpreted Basic occupies comparativly little of the addressable 64K of an 8-bit micro compared with a high-level compiler. The average micro buyer simply doesn't have the choice.

Mr Sharpey is also wildly wrong over the educational value of Basic. It is a common complaint in many university departments that new students whose only computer experience has been programming home micros in Basic frequently have to be "untaught" the bad practices and sloppy thinking engendered by Basic. Mr Sharpey cannot even manage internal consistency in his letter, arguing that OU students find that home micros programmed in Basic improve their studies, followed by a statement about terrible results in computing courses.

To "prove" his point that structured languages are no better than Basic Mr Sharpey attacks the use of Pascal in the Open University's prime computing course (M252) and cites the 1983 course results and drop out rates to show that structured languages like Pascal do not help produce good programmers. It didn't use Pascal at all — it used Basic!

Basic has its place, and if Mr Sharpey wants to use Basic and stuff pundits that's his affair. Those of us who work with computers for a living will continue to use real languages and do things properly.

Alexander MacPhee,
(OU student too),
Barnton,
Edinburgh.

WRITERS SOUGHT

Many people say software writers are mad. We are in total agreement. There is one main reason that brings us to this conclusion. We do not understand why the software houses have not given the Memotech MTX computers any software support. The Memotech range of computers are without doubt the best computers for games writing. The machines have no limitations when it comes to designing games. Despite this the multitude of software writers keep their blinkers on and write for the boring few.

Let's support a British-made, British-designed computer. To help start the ball rolling, a group of current mtx software writers have come together and called ourselves Megastar Games — subtle eh! We will be writing many new games and will accept anyone into our clan who can show us they have the ability to write a game which is better than the ones we have done.

We are not trying to set up another User Group as Memotech already have the best user group with Genpat. This is just a bunch of software writers who are sick to death with software houses.

We will be sending in samples of our work at regular intervals so that everyone can see the high quality of work we do.

Megastar Games,
Cheltenham,
Gloucestershire.

NO ERRORS!

With reference to my program, Aliquid Simplex, published last month, the listing is totally bug free and should work straight away. Some people had difficulty reading the first line however, which should read:
26970 00 3E 13 01 53 43 4F 52 = 89

The only thing to be careful of when typing the program in is that you don't enter one line twice, or miss out a line of data.

Having said the listing was correct, there was a small bug in the machine code itself, the high score routine. It effectively meant that even if you did beat 1000, you wouldn't beat the top score. If you want to correct this, load the program itself, without letting it autostart, and do:

```
POKE 24289,17:POKE 24290,132:
POKE 24291,105
```

Then resave the Rem line program on the final tape as before.

I also feel that I did not say quite enough about the program in the original article.

It is a machine-code game that will run on both Spectrums, which includes:

- Smooth sprite like animation

COLOUR MAGNIFIER FOR ZOOM

Congratulations to Mark Jones for his idea of the Zoom program in last month's issue. I use the program particularly for examining more closely commercial loading screen pictures such as those of Atic Atac and Sabre Wulf. However, black and white pictures sometimes get a little dull, and in certain places the removal of colour destroys the effect. I have therefore written a colour magnifier to go with the program.

The problem arises — this is possibly why the original program does not have colour — when the window is not aligned with the colour attributes. Magnifying colour in this case may be worse than no colour at all. My program therefore has several options. As it stands, the colour is only magnified if the window is aligned, otherwise the colour is removed.

However, by adding the lines under the Rem statements — 1020 and 1040 — you can alter the program in two ways. Line 1020 removes the instructions which stop the colour from being magnified when the window is in the wrong place. Adding this line causes the area nearest to the window which is aligned to be magnified with colour. Adding lines 1020 and 1040 causes the exact area in the window to be magnified, always with colour.

To use the colour program, first type in lines 10-120 inclusive of the program, and run and correct until there are no errors. Then add the other lines and save the program. Find the cassette on which you recorded the Zoom control program and position it at the beginning of the code. Run the program again, loading in the code and saving the new code in its place.

Ian Collier,
Bolton.

```
   1 BORDER 0: PAPER 0: INK 7: C
LEAR 32767: PRINT "Insert tape w
ith ZOOM code on it": LOAD ""COD
E 50000,700
  10 DATA 205,0,107,58,83,195,31
,31,31,230,31,95,23,23,23,71,58,
83,195,184,192,120,58,83,195,58,
84,195,0,31,31,31,230,31,111,23,
23,23,0,71,58,84,195,184,192,120
,50,84,4425
  20 DATA 198,193,185,214,25,47,
111,38,0,84,41,41,41,41,25,17
,0,152,25,34,94,198,58,85,195,79
,6,1,167,48,4,4,129,24,249,120,5
0,88,198,58,86,198,79,6,0,62,192
,4,145,32,4148
  30 DATA 252,120,254,25,56,2,62
,24,50,88,198,33,0,88,34,90,198,
6,24,58,88,198,95,217,237,75,90
198,237,91,94,198,217,14,32,85,8
9,198,8,217,26,2,3,217,13,8,61,3
2,245,217,5137
  40 DATA 19,217,121,167,32,235
29,217,237,67,90,198,235,42,94,1
98,1,32,0,32,19,9,34,94,198,217,
58,88,198,95,217,235,217,16,194,
195,139,195,4672,0
  50 LET c=0: LET d=10: RESTORE
  FOR x=49800 TO 49997
  60 READ a: IF a>255 THEN GO TO
100
  70 POKE x,a: LET c=c+a: NEXT x
: PRINT : PRINT "ALL OK": GO TO
1000
 100 IF a<>c THEN PRINT "Error i
n line ";d: STOP
 110 PRINT "Line ";d;" OK": LET
c=0: LET d=d+10: GO TO 60
1000 POKE 50040,138: POKE 50041,
194: REM alter ZOOM to use colou
r program. Enter next line if yo
u always want colour
1010 POKE 49820,0: POKE 49844,0:
 REM to neutralise: POKE 49820,1
92: POKE 49844,192
1020 REM enter next line if you
want the exact area under the wi
ndow with colour
1030 POKE 49822,58: POKE 49846,5
8: REM to neutralise: POKE 49822
,50: POKE 49846,50
2000 SAVE "ZOOM"CODE 49800,908
```

- Kempston joystick option
- High score table, and
- Amazing new type of music that is a simulation of two channels. Jingles are played during the game, and longer duets on the title screen.

If anyone should find difficulty getting into the game itself, the method is to press space, to stop the music and then 'S' immediately afterwards. Tapes of the game are still available from me for £3 at 16 Viking Way, Pilgrims Hatch, Brentwood, Essex, CM15 9HX. This will shortly be released under the label of Turtle Software.

D.R. Aspinall.

ATMOS BROOD

Thank you for publishing the Oric program Brood in the November issue of *Your Computer*.

The article suggested that for Atmos conversion, only the Plot statements had to be altered. However, for full Atmos compatibility more changes need to be made.

Change the following lines:

```
130 WAIT 7 - LE:GOTO 100
225 LI = LI - 1:PLOT 2,25,STR$(LI)
290 DOKE 634, 48040:POKE 638,27:
    END
630 DOKE 634, 48120:POKE 638,21
745 FOR A = 0 TO 9:READ B:POKE
    A,B:NEXT
765 POKE 85,59:POKE 86,191:
    POKE 87,32
770 POKE 88,21:POKE 89,165
775 POKE 15,191:POKE 16,G:POKE
    17,0:POKE 18,35: PLOT 32,0,T$
1005 FOR A = 0 TO 9:READ B : NEXT
1335 DATA 0,EO,5,DO,5,A2,55,4C,
    2,99,A2
```

T.W. Phoeng,
Holland.

CURSE BUGS

With reference to my program "The Curse of Abu Simbel" for the Dragon in the November issue of *Your Computer*, a few bugs seem to have crept into the listing.

Line 600 has been tagged on to the end of line 590, so after the GOTO 3780, (Enter) should be pressed and 600 should start on a new line.

The same has happened in line 670, after the GOTO670. In line 1250 the GOTO3770 should be GOTO3780, and in line 1530 the last statement should read GOTO 470 instead of GOA.

Nick Stevens,
Musselburgh,
East Lothian.

CORRECTIONS

Line 60016 in December's Spectrum Telsoft program is incorrect. It should read:

60016: 50EDCD47EE38FBCD,5AF

Some people have had trouble getting the ZX-81 High-Res program to work. Try the following procedure: using Listing 2 enter eight numbers to define character code 3 as a UDG — 0,0,0,0, 30,160,160,32. When the computer asks if you want to save the program the answer is no. Now enter this Basic program and run it.

```
10 RAND USR 25614
20 FOR A=1 TO 30
30 PRINT AT 11,A;CHR$ 1;CHR$ 3
49 RAND USR 25686
50 NEXT A
60 IF INKEY$="" THEN GOTO 60
70 RAND USR 25602
```

EDITORIAL

1984 WAS THE YEAR that made the whole home-computer industry look back in angst. They swore they would never commit the errors of the past again, and then promptly went on to restage the worst and the best of 1983.

The QL gave the year an astonishingly promising false dawn. With 128K, bundled software, built-in mass storage and a 32-bit processor, it contained the very latest technology — up to four months late for those who ordered first.

But despite the delays the QL remains important: it was the first complete home computer in what became the year of the system. Coleco, Amstrad, Commodore with the Plus 4 and Tatung's Einstein produced variations on this total computing theme. Of these five manufacturers only Amstrad has found big-volume success.

If the complete computer system was a sign that the home-computer industry was growing up, software compatibility and standardisation were supposed to be all part of the same process. Microsoft and the Japanese electronics giants worked together with the MSX standard to drive out incompatibility wherever it lurked. Overpriced machines were produced by big names like Sony, Toshiba, Canon and Mitsubishi, yet the long-awaited and much-feared Japanese invasion has for the moment turned into a phoney war with the real fighting postponed for another, more distant Christmas.

As the Japanese were introducing expensive micros to fight their battle, Jack Tramiel's arrival at Atari from Commodore opened up a new front in the price war just when the market was beginning to stabilise.

Tramiel parted company with Commodore in January, had collected Atari for $240 million in the early summer, and was busy making price cuts by the autumn. The 600XL tumbled to £90, and in December the 800XL moved enticingly down to £130 from £250.

In the earlier part of the year the noise in the background was not the sound of falling prices but companies crashing. The two best known names to disappear were Dragon and Camputers but the most commotion was caused by the collapse of a software house — Imagine.

The Liverpool-based software producer was famous for its extravagant claims and continued to blow its own trumpet right up to the end, and beyond — hype after death. But it was the software makers who gave colour to the end of an otherwise dry year for computing.

Some of the products that were pushed out for the Christmas period were not only very playable but had elements of novelty — just when computer users were beginning to forget the meaning of the word. This is especially true of games like Ultimate's Knight Lore, Acornsoft's Elite, Gargoyle's Tir Na Nog and Automata's concept program Deus Ex Machina.

Excellent U.S. imports also muscled in on the British charts — Bruce Lee, Boulderdash, and Ghostbusters with its classy music and synthesised speech. Along with Dallas, Alien, Dangermouse and Fall Guy, Ghostbusters typifies the 1984 gimmick of offering the game of the film, of the TV series, of the book, of the tee-shirt.

But if 1984 scared the industry as the computer boom's exponential growth evaporated, 1985 appears even bleaker. With the disappearance of the skateboard-type fad element from home computing, any success will be hard won and well planned.

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

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Acorn's new spare leg stocking filler boots up Electron

ACORN'S AVALANCHE of peripherals continues unabated with disc cassette drives for the Electron, synthesisers and second processors for the BBC. The disc drive/interface unit, Plus 3, looks like a ruthless attempt to exploit parents' propensity to buy anything shaped like a leg for December 25. But at £229 it's an expensive Christmas stocking filler, even if it does have 300K storage on a single-sided 3.5in disc as well as the interface and a new disc filing system.

If only Acorn had built cartridge, joystick, printer and expansion ports into the Plus 3 it could have made the Electron look like a worthwhile purchase rather than a deliberately underspecified machine designed to milk the purchaser for every last penny on peripherals.

Acorn has also launched Music 500 — a £200 synthesiser, keyboard extra, which plugs in to the BBC. Music 500 uses a new computer language called Ample to manipulate sound and music.

Continuing Acorn's promises to make the BBC infinitely expandable 10 Megabyte and 30 Megabyte hard disc storage units are now available as well as the 32-bit architecture 32016 second processor which comes with a bundle of languages — BBC Basic, C, Fortran 77, Cambridge Lisp and Pascal. But just in case you were thinking of saving up pocket money for the ultimate add-ons for your BBC we should warn you that the 32016 second processor plus a 30 Megabyte hard disc will set you back over £3,000.



Frankie goes to Silicon

JUST BECAUSE Frankie Goes To Hollywood's computer is a £100,000 Synclavier system rather than a £100 Sinclair isn't going to stop them putting out a Pleasure Dome game of the record for the Spectrum and Commodore 64.

Jill Sinclair (no relation) of Frankie's record label ZTT has fixed up a deal with Ocean Software to produce a £10 game which will be released next month. Will home micro owners be as dismissive of the first Frankie computer game as FGTH's sound engineer was of micro freaks trying to make Frankie-style music at home? "Everyone else with their CX-5s and Commodore 64s will be struggling desperately hard with not really a hope in hell" as he said in our September 1984 issue.

Seriously: computers damage your health

IF COMPUTERS were really user-friendly the first message to flash up on the screen might be "are you wearing your protective apron?". Rollenworth International is taking warnings that sitting in front of a VDU is bad for you so seriously that it is selling microwave proof aprons to computer operators.

They are a lightweight equivalent of the lead aprons radiologists wear when they give you an X-ray, although this time made of nickel-coated polyester. Rollenworth points to a series of reports suggesting that sitting close up in front of a TV screen for hour after hour can do you harm, particularly if you are a pregnant woman. A survey by the Civil Service Medical Advisory Service among 800 female employees of the Department of Employment showed that 36% of the pregnancies among VDU operators were abnormal compared to 16% among a control group. Other reports from Denmark, Canada, Australia and America have reached similar conclusions.

But computer companies do not accept these findings — pointing out that they could be statistical anomalies or that the VDU operators are not being compared with similar people working under the same conditions. Most home computer enthusiasts will not be working eight hours a day at the keyboard anyhow so are unlikely to experience problems on the same scale as professional VDU operators. But if you regularly work through the night at your micro you should take regular breaks and make sure you have a comfortable seating position as well as the best possible viewing conditions if you are to avoid more mundane problems such as eyestrain and backache.

If you either have health problems or know of someone who does, which you think might be attributable to the use of a computer, please send the details to Healthscreen, *Your Computer*, L.221 Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.



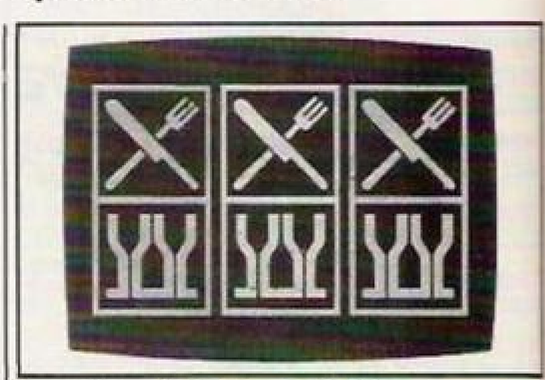
And a bottle of your Chateau Lafitte for my Spectrum . . .

NOW HIS WINE 'N' DINE program is about to put Spectrums in off licences all over the country, but one year ago Ian Hoare was just a wine connoisseur and chef who would no more have touched a computer keyboard than he would have drunk a bottle of Concorde.

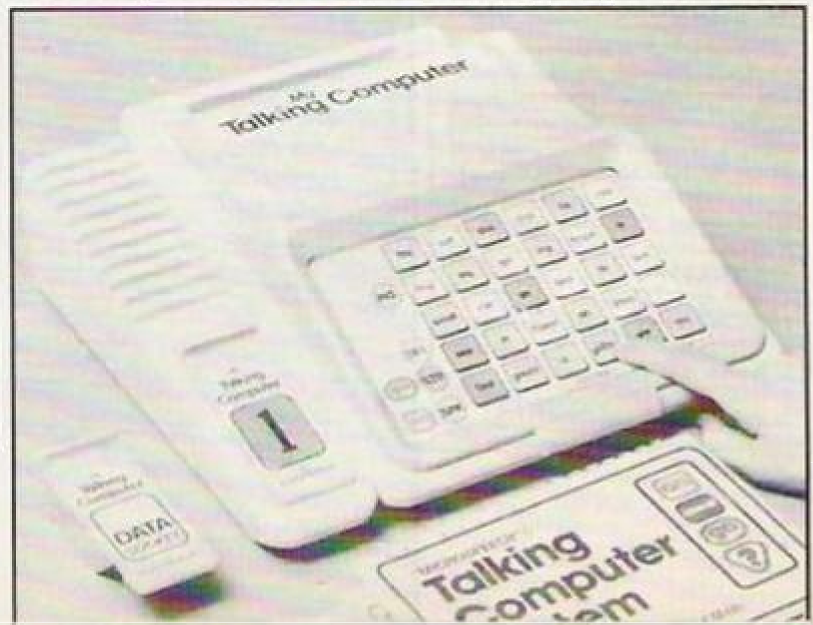
Then as a result of a strange sequence of events involving a bet placed on the outcome of a Dutch theology student's examination results Ian came in contact with a Spectrum. Within months The Computer Cookbook, which was the first program he had written, was in the charts — proving that people would buy "useful" products such as recipes even if the program itself was not very sophisticated.

Since then Ian has become a machine-code fanatic — partly motivated by his colour-blindness to break into commercial programs protected by "these beastly colour code charts". Wine 'N' Dine will recommend wines to customers in branches of Peter Dominic — all they have to do is key in what sort of meal they are about to have. Christmas dinner produces three suggestions ranging in price from £2.45 to over £9 with the Lagunilla Villa Gran Reserva Rioja 1973 at £3.69 as Ian's own recommendation for value for money.

For afters the program suggests champagne, fizzy wine or Madeira with the Christmas Pudding. There are over 200 other dishes which Wine 'N' Dine matches up with a choice of 450 wines.



My Talking Computer's new expansion cartridge includes a Story Maker which teaches the essentials of word processing but using spoken sentences rather than text on screen. The new 128K expansion Rom which costs £18 consists of 16 different programs with overlay cards for the keyboard. So far Microspeech has sold 50,000 of its £60 speech-synthesiser based Talking Computers.





Tough Tramiel promises 8 new Ataris including QL smasher

WITH ATARI'S latest aggressive bout of price cutting setting the scene — the 64K 800XL is now £130 compared to £250 last year — Jack Tramiel jetted in to Britain to tell us what the corporation has up its sleeve for us in 1985.

Hard man Tramiel survived the Auschwitz deathcamps and then went on to acquire a ruthless reputation himself as he built Commodore up to become the biggest home computer company in the world. But he resigned from CBM in January 1984 and now that he has taken over Atari he believes he can set home-computer prices tumbling once again just as he did when he introduced the Commodore 64 at a fraction of the price of its competitors.

When he bought Atari this summer 900 people lost their jobs in the first two weeks and he has been known to sack people over the Tannoy.

Now he plans to sell four "families", as he likes to call them, of computers under the Atari name. The first family will be based on the Atari 800XL which will be redesigned to make it cheaper to produce and will be given a numeric keypad. There will be 64K and 128K versions plus a portable with 256K of memory and a 5in. screen as well as a special music computer.

The next family will be 68000-based like the QL and the Macintosh and will start at around £300. It will incorporate an advanced graphics chip aimed at giving Macintosh quality graphics but in colour and at a fraction of the price. This will run under a new operating system TOS — and yes the T does stand for Tramiel.

The eight-bit family will all be compatible with existing software and along with the new 16-bit range they will be shown at the January Consumer Electronics Show in Chicago and launched in Britain this spring. Later in the year he hopes to launch a range of work stations for less than $1,000 which will be based on the massively powerful, true 32-bit 32032 chip.



There will also be a full range of peripherals including printers ranging from £60 to £600 as well as floppy and hard discs. Further ahead Atari hopes to introduce laser disc-based micros in 1986.

Tramiel's strategy is based on cutting costs all down the line — he is currently trying to raise money to buy a totally automated factory to churn out Ataris as cheaply as possible. "The customer is much smarter than I am", or so Tramiel professes to believe "and if someone can produce something cheaper and better they'll buy it from him. Needless to say he believes the Atari 800XL "is a better product at a better price" than the Commodore 64. But then again he says "I believe computers are fun", yet he never smiled once all the time he was in Britain.

One million K in every bite

WITH 1,000,000K of memory almost anything is possible. Shugart's new laser disc drive can put 1,000,000K — a Gigabyte — on every disc. You cannot erase anything from the disc so it is not as resuable as a conventional one but with so much empty space to play with you might as well keep everything for posterity.

Of course it is not going to be available tomorrow at home computer prices but the 12in Optimem 1000 is now being sold to other computer and peripheral makers — OEMs or Original Equipment Manufacturers as they are called — at a price of around £5,000. Shugart predicts that the OEM price will be down to around £1,000 in a couple of years with giga storage available to everyone at no more than the cost of an ordinary disc drive before the end of the decade.

Commodore's Apple-beater

COMMODORE IS NOT going to be sitting still while its old boss Tramiel tries to hit back at it through Atari. Commodore has a CBM-128 on the stocks for the home market as well as a cut down Macintosh clone at bargain-basement prices which used to be known as the Lorraine when the project was being developed by an independent company called Amiga.

What with that and a Commodore IBM PC compatible, not to mention a Z-8000 based micro on the stocks, the company is going to be pretty busy.

With the aid of this box I can make Duran Duran sound like Mickey Mouse backwards

WITH DATEL'S Digital Sound Sampler, Duran Duran effects, Darth Vader speak and Mickey Mouse noises are no problem. You can use the device simply as a real-time echo unit or if you want to stretch your Spectrum to the limit then according to Mike Connors of Datel "you could write a concerto from one piano note".

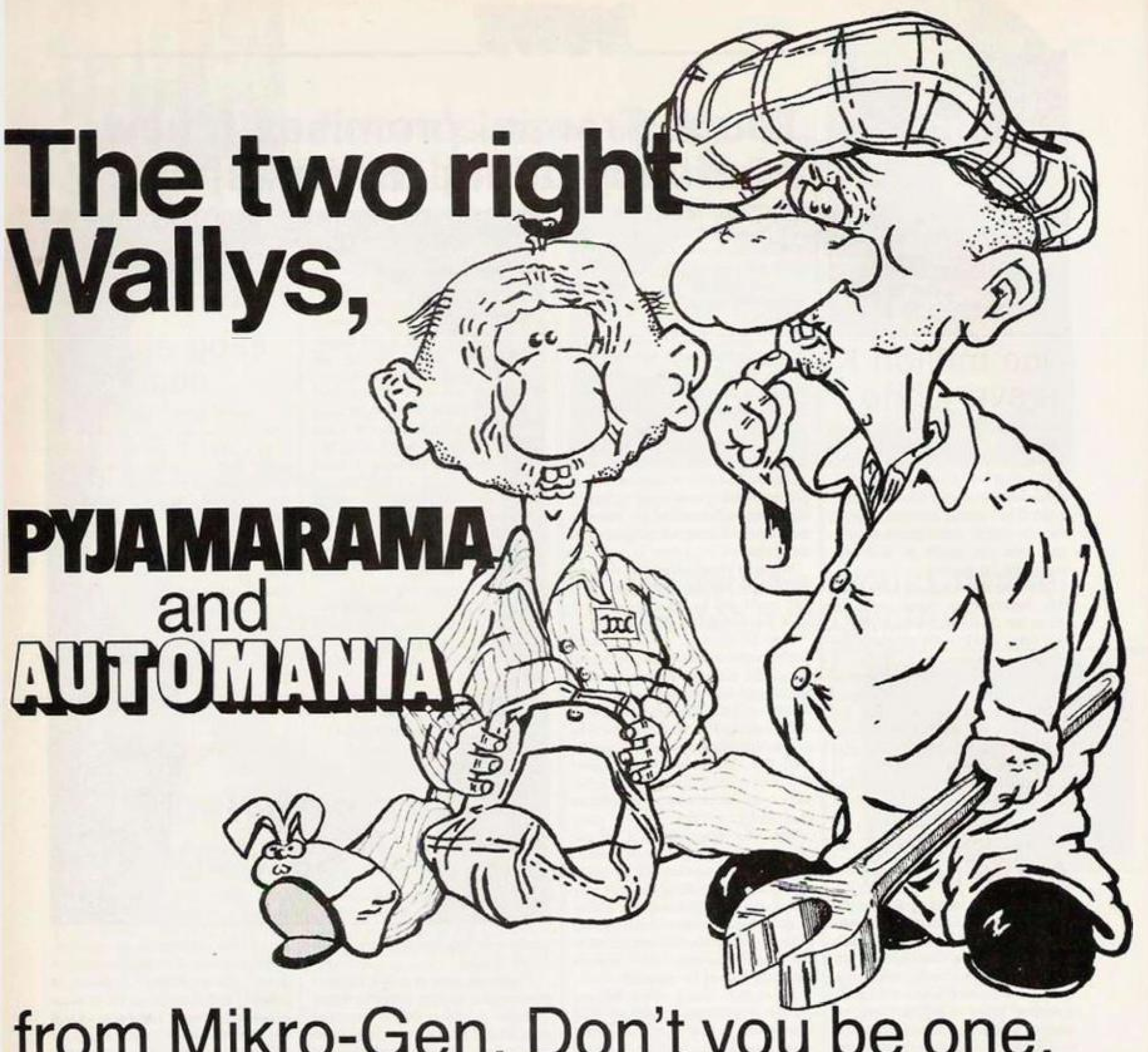
The £50 sound sampler has full eight-bit analogue to digital converters so you can feed in sound either through a microphone or from cassette recorder or other source, then play with it in digital form before outputting the result through D/A converters.

Once the sound is digitised the only problem is finding enough memory to store it. At a rate of 38,000 checks a second the Spectrum can only store about four seconds of full sound.

But this is not as much of a limitation as you would think since most of the sounds you would want to use are very much shorter than that and you repeat the same notes many times in a piece of music — so you could compose a simple piece several minutes long at one go or build a more complicated piece in shorter chunks.



You can use the unit to digitise short bursts of your speech to incorporate in games. But the most impressive part of the software that comes with the Datel device is a sampler which allows you to take a note and then sequence it to create a whole musical instrument with different notes and pitches based on that one sound. Datel is on 0782-273815.



from Mikro-Gen. Don't you be one, order your copies NOW!

● 'Automania must be a front-runner. It features Wally Week who is not a period of time but an idiotic character a la Cuthbert, and also a beautifully animated 2 inch or so sprite ... the graphics are pretty spectacular and the game is amiably silly and good fun ... there's no reason not to go out and buy this one.'

POPULAR COMPUTING

● 'Pyjamarama is the excellent sequel to Automania ... The graphics are extremely good ... Pyjamarama is a really first class, amusing and challenging game that is original in its concept and could well make the number one spot.
Highly recommended.

COMPUTER TRADE WEEKLY

Instructions	100%
Playability	100%
Graphics	100%
Value for money	100%

● 'Automania, sub-titled, Maniac Mechanic, is a must for all game players ... invest in this colourful game with superb graphics and animation.'

SOLID GOLD

Keyboard play: very responsive
Use of colour: very good
Graphics: superb with excellent animation
Sound: great tune (continuous) with well used sound effects – sound may be switched off
Skill levels: one
Lives: three

● 'Automania has some of the best animation and realistic graphics that I have ever seen. All the graphics are large and colourful, and, needless to say, they move smoothly ... The best game that Mikro-Gen have ever produced and worth buying.'

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Spectrum 48K – £6.95

Return of the Enterprise

THE ENTERPRISE computer is finally available after a nine-month's delay.

Available only through Prism, it may be in the high street early next year, when volume production gets underway.

According to Enterprise, the bugs in the "Dave" video chip which caused the delay have now been cured.

The 64K model is £249.95 but the 128K model is still "available soon".

The Enterprise offers 48K Rom with built-in word processor, 64K Ram, up to 256 colours, three stereo sound and one noise channel and a very comprehensive Basic on cartridge.

It also features a full keyboard with function keys and a joystick. It has a wide variety of interfaces.



Handy Spectrum may follow One Per Desk

WHILE SPECULATION increases that Sinclair is finally about to launch the portable Spectrum which he exclusively revealed to *Your Computer* back in November 1982, ICL has at last released the Sinclair-designed work station which he also told us about at the same time. Both were originally intended to hit the market before the end of 1983.

The ICL concept is remarkably similar to the artist's impression we published at the time — with phone, computer, keyboard, Microdrives and screen in one unit but in January 1983 he decided to adopt the 68000 processor for his more advanced designs. At a later stage of the project he had to abandon using his flat screen in the ICL although it may still surface on the unconfirmed £300 portable which may make do with one Microdrive.

Adam falls from grace

COLECO HAS FINALLY pulled the rug on its all-in-one Adam family computer system. The original concept of a 64K computer with a built-in word-processor program complete with disc drive and printer for around £500 sounded brilliant when it was first announced in 1983 — and it still sounds good today.

But as production delays pushed back the launch date the price started climbing and the specification dropped. Out went the disc drive to be replaced by a high-speed tape on production machines, and when the Adam finally went on sale in Britain early in 1984 the price was nearer £800.

The machine was never pushed very hard either in America or Britain and there was very little software available other than games written for the Colecovision games console on which the Adam was based.

Sinclair admits to megagames — now the truth can be told

LIKE A SIGHTING of Lord Lucan or Martin Bormann, any pretence to have seen an Imagine megagame is likely to be disputed but we are sticking by our claim that we have glimpsed Bandersnatch — and not in Patagonia but in the house of Sinclair. Sinclair has now admitted that Imagine refugees David Lawson and Mike Glover of Fireiron are about to produce Bandersnatch for him.

But with every software house now describing its latest hack offering as a megagame we asked Bruce Everiss of Tansoft — no relation of Bruce Everiss who used to work for Imagine — what the megagames were originally intended to look like: "Some other software houses have plagiarised the term. They are using it to describe their latest ordinary products. A megagame is a film which you, the player, take part in.

"You become one of the cast of characters that each have separate and identifiable personalities. What happens when you meet them depends on their personalities and also on what you do, as in real life. Characters then remember how they have been treated by the player and act accordingly on subsequent meetings."

Controls are also important, Imagine envisaged that everything would be controlled by joystick: "There are no lives or score. It is a matter of trying to achieve what you the player want. There is no status line to ruin the realism, the whole screen is action."

The characters use speech bubbles to communicate though given the extra capacity of a Microdrive or disc it could equally well be by voice. Stunning graphics were vital — the megagame team involved twice as many artists as programmers. Realistic animation is also important — especially getting rid of the artificial nature of the transition from one room to another in conventional games.

Incorporating background music also makes the game more like a film. The Imagine megagames would have achieved all this by using a plug-in 64K Rom with bank-switching for quick transitions from one part of the game to another.

There would also be a supplementary cassette tape. This arrangement would discourage pirates. "They would need to copy the Rom contents, the Ram contents and the special hardware necessary for the bank-switching and address decoding. It would be cheaper to buy the real thing."

In all probability the version of Bandersnatch which Sinclair hopes to release will be on Microdrive — perhaps primarily targeted at the QL.

YOUR COMPUTER TOP 20

Game	Company	Machine
BC's Quest for Tires	Software Projects	BBC
Booty	Firebird	Spectrum
Bruce Lee	US Gold	CBM 64
Daley Thompson Decathlon	Ocean	Spectrum
Combat Lynx	Durrell	Spectrum
Eddie Kid Jump Challenge	Martech	Spectrum
Elite	Acornsoft	BBC
Eureka	Domark	CBM 64
Ghost-busters	Activision	CBM 64
Jet Set Willy	Software Projects	CBM 64
Knight Lore	Ultimate	Spectrum
Lords of Midnight	Beyond	Spectrum
Manic Miner	Software Projects	BBC
Pyjamarama	Microgen	Spectrum
Raid Over Moscow	US Gold	Spectrum
Steve Davis Snooker	CDS	Spectrum
Tir Na Nog	Gargoyle	Spectrum
3D Grand Prix	Software Invasion	BBC
Under-wurlde	Ultimate	Spectrum
Zaxxon	US Gold	CBM 64



For the most fun you can have for £30 on your Spectrum the DK'tronics 3 channel sound synthesiser takes some beating. It comes with a Music Designer cassette which claims to give you Beethoven to Bowie — Star Wars to splats on your Spectrum. Inside is the 3-channel AY sound chip which is used in MSX machines and many other computers with better sound than a Spectrum. Cunningly DK has also released another product which looks exactly the same even down to the speaker but which contains an SLO 256 speech chip. The £25 speech synthesiser has a text to speech facility and is at its best using deliberately misspelt English words to get the required sound.



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BEGINNERS *first bytes*

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.

I could do that...

For November's competition we wanted you to write fill routine in Basic. The standard of entries submitted was very high indeed, displaying all sorts of fancy programming techniques. We were particularly impressed by the Spectrum program from R. Smith, 59 Bateson Road, Cambridge, CB4 3HF. He managed to squeeze a fill routine to handle convex and concave shapes alike into just two lines. It works by recursively calling itself, a technique which makes heavy demands on the Basic stack but is quite adequate for small shapes. It is not notably speedy but takes the £15 prize for sheer economy of code.

In this month's competition we would like you to produce some artwork. Write a program not longer than 10 single statement lines that creates an interesting or "artistic" pattern. If your micro only has a low resolution display don't worry — we will make allowances.



```
  10 REM Draw some tricky shapes
  20 PLOT 50,50: DRAW 50,30,PI:
DRAW 20,0: DRAW 0,-40: DRAW -70,
0: DRAW 0,10
  30 LET x=103: LET y=75: GO SUB
 100
  40 PLOT 110,100: DRAW 0,50: DR
AW 40,0: DRAW 0,-50: DRAW -40,0
: CIRCLE 130,130,10
  50 LET x=115: LET y=105: GO SU
B 100: STOP
 100 IF NOT POINT (x,y) THEN PLO
T x,y: LET y=y+1: GO SUB 100: LE
T y=y-2: GO SUB 100: LET y=y+1:
LET x=x+1: GO SUB 100: LET x=x-2
: GO SUB 100: LET x=x+1
 110 RETURN
```



Programs on the air

OCTOBER'S FIRST BYTES described how free software is broadcast over the radio twice a week by the BBC. In fact there are some other free programs winging their way through the air during most of the day. To gather them is rather more expensive, though.

The system is called Telesoftware, and is literally software that comes through television. The mechanism used for getting this software to you is rather more complicated than that of Basicode. It depends on details of how television is broadcast.

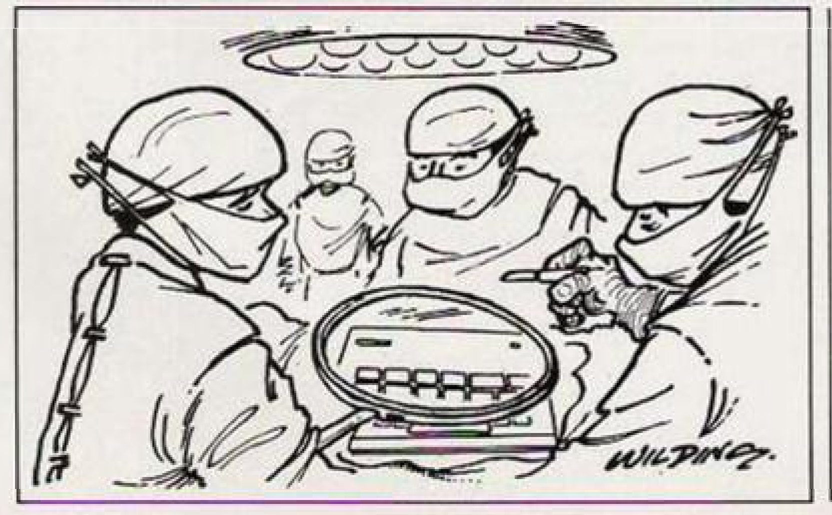
A normal TV picture is made up of some 600 lines on the screen. But in fact 625 lines' worth of information is transmitted. Some of it is technical details sent by the broadcasters and engineers for their own benefit. But some of the spare lines carry the Ceefax service.

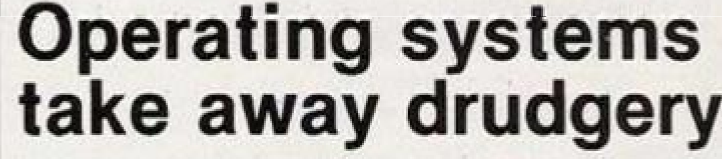
This is a bit like Prestel, with pages of information on various topics. You can access them with a special Ceefax adaptor that is fitted to your TV. But there is an additional service that is specially for micros, and requires a Telesoftware adaptor.

This adaptor is only available for the BBC micro at the moment, and costs a rather hefty £200. It is produced by Acorn, the manufacturers of the BBC micro, and can be obtained from Vector Marketing on (0933) 228953. As well as allowing you to access the Ceefax pages on your micro, it also enables you to download software that is sent in the form of pages of Basic programs.

A complete program will typically

(continued on page 49)





Operating systems take away drudgery

MOST PEOPLE take it for granted that they can start hammering away at the keyboard as soon as they have powered up their gleaming micro. If you are playing a game you expect to find yourself instantly assailed by crazed alien beings intent on mindless destructions. You are not conscious of the actual working of the machine, except possibly during the slight — or not so slight — pause while the cassette loads.

Few realise that the initial command Load or Chain or whatever, is in fact part of a so-called "high-level" language, which happens to be Basic. Even fewer are aware that underneath all this activity is something thought about even less — the operating system.

Yet without this unsung hero/heroine, much of the power of a micro would be lost. Programming would

(continued on page 49)

Programs on the air

(continued from page 47)

run to several pages. These are sent out one at a time in each sweep through Ceefax, so it takes several seconds to build up all the program. Generally speaking the order in which the pages are received is irrelevant, since the programs have line numbers which allow the original to be reconstructed.

Each page is error-checked as it arrives. That is, it is scanned to see if any errors have crept in during transmission. If a page is accepted, then it is error-free. If it is not, then you have to wait for another cycle of Ceefax to pass by until the same page is broadcast again.

Once the complete program has been built up, you can run it like any other. The software itself is free, and is currently being changed every two weeks. It comes from such sources as the Chip Shop, programs sent in by the public and Telsoft, a group based at Brighton Polytechnic.

To use the service, you will need not only an adaptor, but also a TV licence. This is so even if you are using a monitor with your micro. You are allowed to make two copies of any program broadcast, and adapt or modify it, but only for private purposes.

There are about 6,000 users at the moment, and the number is growing at the rate of 300 a month. There is a possibility that more "spare" lines will be allocated to the Ceefax service, which would allow more telesoftware to be broadcast. Another future development that is being considered is to provide telesoftware on cable television if and when that arrives. Even if it doesn't, you can always be sure that there will be some interesting programs on the television.

How operating systems take away drudgery

(continued from page 47)

be back in the stone age. So just what does it do?

Operating systems are the drudges of the micro world. They do everything that no "high-level" language would stoop to, and what users and programmers take for granted.

After all, while you play that megagalactic adventure game, or turn in a really neat piece of programming, who is looking after the screen and the keyboard? It certainly isn't you, and neither is it Basic, which is pretty good at If . . . Thens and Gotos, but not so hot at keeping the VDU going.

All the while that the micro is running, the operating system is diligently looking after the housekeeping functions. It scans the keyboard for input, it keeps the screen ticking over, and if your system extends to the full glory of a disc drive, it handles all the problems of getting information in and out of that.

Notice how these are all very "low-level" functions. The operating system is dealing with basic things to do with the hardware. Just as Basic provides a nice comfortable cushion between you and all the complications of your micro, so the operating system insulates Basic from the harsh realities of the processor, keyboard, VDU and disc drives.

Apart from shielding you from gory silicon details, there are other advantages in having this invisible servant. For example, if a programmer writing in Basic wishes to transfer software to another machine, he or she only has to worry about how the Basic changes on a different machine; the actual details of the hardware are not important.

If the Basic itself had to deal with all the nitty-gritties of a particular machine, it would be irrevocably tied to that particular model. This would make program conversion even harder.

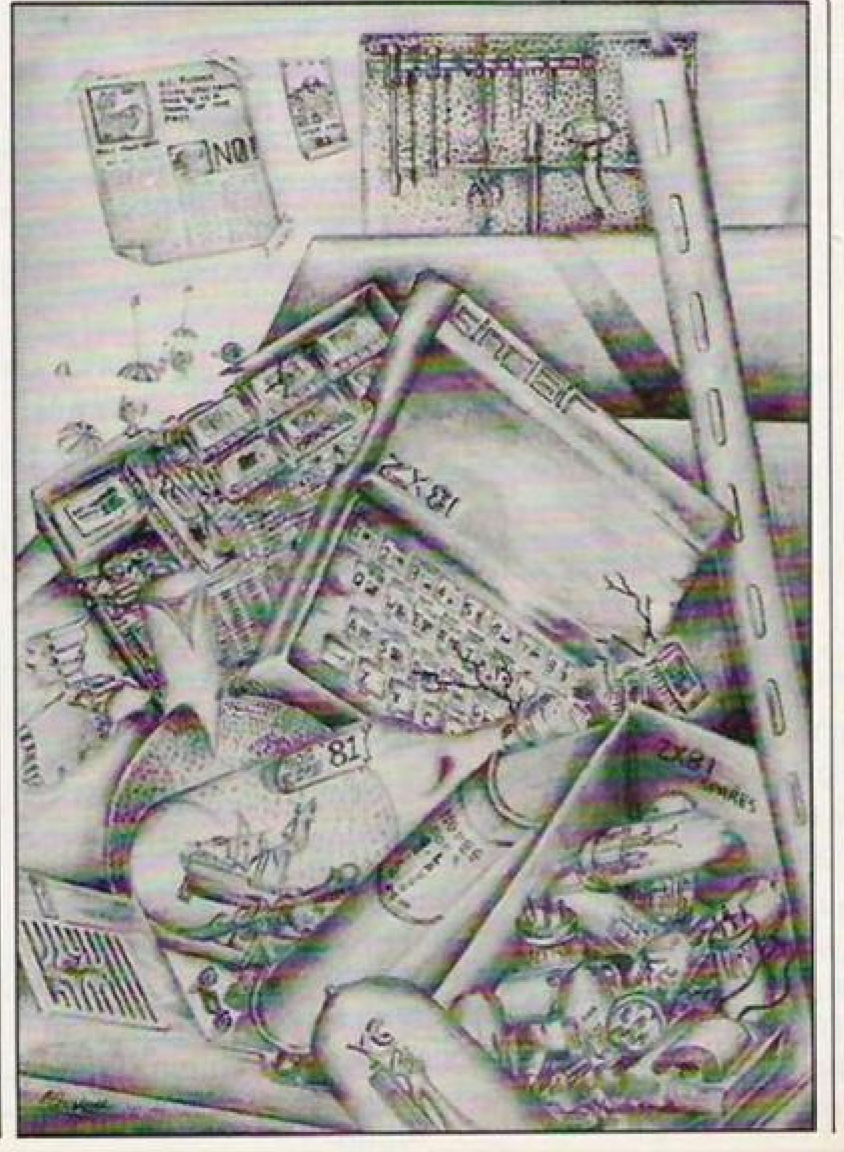
With an operating system separating the high-level language like Basic from the hardware, it is also possible to slot in different languages. Provided their "bottom sides" match the operating system, they can ignore the finer details of the hardware. This enables you to put more exotic languages like Pascal, Forth and Lisp on micros.

They then function in exactly the same way as Basic, with relatively comprehensive commands that let you write programs, and leaving all the messy details to the operating system which they communicate with rather than directly with the keyboard and VDU.

Disc drives are becoming increasingly common on even cheap home micros. Storing 100,000 bytes of information on a 5.25in. or 8.5in. piece of plastic is a tricky business, and the operating system associated with it is quite complex. It is also generally incompatible with other operating systems. The practical effect of this is that you cannot read Commodore discs on a BBC Model B.

If, however, you choose the right operating system to begin with, you may well be able to run software from quite different machines. This is because the programs generally only deal with the operating system, so if this is the same, there will be no effective difference as far as the software is concerned.

There is one standard operating system, rather venerable now, but nonetheless usable for that, which has been very widespread in general business and "serious" applications. This is CP/M.



CP/M was initially designed to handle all the hardware details of machines built around the Z-80 processor family. Thus any micro which uses this chip could, potentially, run under CP/M. This would then give it access to the huge pool of software already written for this system.

This is what the Amstrad and Tatung Einstein are designed to do. By running their discs under CP/M, they hope to tap some of this wealth of software which is already available. In this way they would leapfrog many of the problems of waiting for programs to appear on a new machine.

Normally the user is completely isolated from the operating system itself. The nearest you are likely to come to it is if you start programming in machine code. This effectively misses out part of the buffering effect of a high-level language. Instead, you talk directly to the main chip to get basic computational tasks carried out as quickly as possible.

You will, however, still have to deal with the operating system. This is because things like sending information to the screen or capturing data from the keyboard require handling in some way, and the operating system provides a quick and efficient way of doing this.

Normally the operating system is present on a special Rom chip supplied with the micro. Some systems provide it partly internally, which handles keyboard and VDU, and partly on a disc when a disc drive is added. This Rom is in addition to the Rom which often holds Basic. Sometimes the size and complexity of the operating system can cause problems, as with the QL.

Here, it proved impossible to cram all the operating system and the SuperBasic into the space available on the Rom chips. Hence the unsightly "kludge" — a small board with extra chips — that was stuck into a back socket on early machines. Mostly though, operating systems are so successful you hardly ever know they are there.

Drawing by Andrew Baskett

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If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

Local news

Guildford

The West Surrey Computer Club has changed its venue and now meets on the 2nd Thursday of the month at the Stoke Hotel, Guildford. They also run a BBC User Group which meets on the 3rd Friday of the month at the Guildford County College of Technology. The club caters for all interests and has regular illustrated lectures. Contact Jan Spencer on 0483-63512.

Newtownabbey

A White Lightning User Group is being formed in Co. Antrim for fans of the Spectrum games designer program. Do-it-yourself alien designers should contact Terry Kelly on 0232-51539, or write to him at 353A Merville Garden Village, Newtownabbey, Co. Antrim. N. Ireland.

Southampton

Southampton Amateur Computer Club has its main meeting on the second Wednesday of each month at the Medical Sciences Building, Basset Crescent East, between 7.30 and 10.30 pm. There is an active BBC group which meets at the Creastwood Centre on the last Friday of each month. Contact Paul Blitz on 04215-69050.

Crewe

The South Cheshire Atari User Group meets on the first Thursday of each month at the Earl of Crewe, Nantwich Road, Crewe. The club has over 30 members and costs £5 a year for adults, or £2.50 for children. Contact Mr. A. Davis, 48 Blagg Lane, Nantwich, Cheshire or ring 0270-626969.

COMPUTER club

Meirion Jones looks at how the major political parties use computer technology.

RED, YELLOW and blue, you can have any colour you like so long as it is a political computer club. Conservatives have the Conservative Computer Forum, Labour has the Labour Party Computer Action Group and the Liberals have Micro Lib.

The Conservatives started first, way back in 1978 when Michael Spicer, who is now Deputy Chairman of the party and MP for Worcester South, set up the Forum primarily to advise on technology policy in the run up to the 1979 election. But since 1981 the organisation has been more practical, giving seminars to Members of Parliament on the benefits of computerising their constituency organisations and helping local parties decide which computers they should buy and how to make best use of members' home computers.



Dr. Jeremy Bray MP, Shadow Spokesman for Information Technology, pictured here with Timothy Schoonmaker, Micronet's Managing Director.

At constituency level the CCF started off 1984 by recommending the Tycom computer, but after the problems that beset the company the Forum now has discount deals with Apricot and ICL. Gordon Ayres has set up a BBC User Group to help co-ordinate activity at ward level. In the summer Conservative students from Thames Polytechnic were sent into the backwoods of the Tory shires to preach the new technology testament.

It costs £5 to join the CCF which includes a subscription to the Forum's paper Micro News. Local Labour parties' finances rarely stretch to office-style micros although some have Apricots, but BBCs are the most common. The Labour Party Computer Action Group is particularly enthusiastic about Prestel and Micronet 800.

The membership fee for joining the LPCAG is £10 which includes a magazine called Proteus, regular news on Micronet and free access to software that was battle tested successfully in the Chesterfield bye-election which put Tony Benn back in Parliament. When LPCAG decided to open its Micro net 800 pages to the public last year British Telecom at first tried to stop it on the grounds that politics and religion should not be broadcast through Prestel.

But Jeremy Bray MP, the shadow spokesman on science and technology, objected on the grounds that Sir George Jefferson, BT's Chairman, "did not check the legality of such discrimination. To classify religion and politics with prostitution and crime while purveying share prices, exchange rates and the weather, betrays a singularly perverted view of society". At the 1984 conference the Labour Party used a BBC B to work out the results of the constituency votes for the National Executive Committee, the organisation which controls the party.

You can find out more about LPCAG from Roger Ward, Labour Party, 150 Walworth Road, SE17. The Conservative Computer Forum can be reached through Jenny Riley, Highfield, Church Road, Purley, Surrey and Micro Lib can be contacted on 0422-843785.

software that's hard to beat...

MSX
AMSTRAD
48K SPECTRUM

TASWORD TWO

The Word Processor ✱

"If you have been looking for a word processor, then look no further."
CRASH June 1984

"The number of on-screen prompts, together with the excellent manual, make it ideal – even for an absolute beginner."
PERSONAL COMPUTER WORLD
September 1983

"Without doubt, the best utility I have reviewed for the Spectrum."
HOME COMPUTING WEEKLY April 1984

TASWORD TWO ZX 48K Spectrum £13.90

TASWORD MSX

The Word Processor

The Tasman Word Processor for MSX microcomputers.
All the features of the Spectrum version.

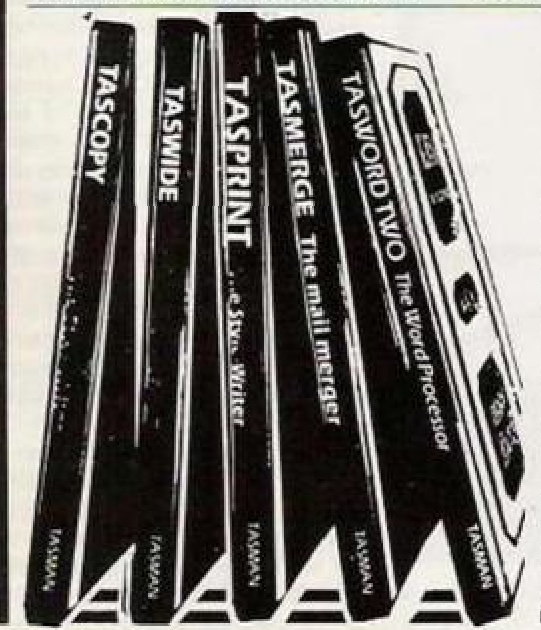
TASWORD MSX MSX Computers £13.90

TASCOPY

The Screen Copier

Screen copy software for Spectrum with Interface 1 and Amstrad CPC 464. Print high resolution screen copies (in a choice of sizes), and also large 'shaded' copies with different dot densities for the various screen colours. Tascopy supports all eight pin dot matrix printers with Epson type control codes, e.g. Epson RX-80 and FX-80, Shinwa CP-80, Mannesmann Tally MT-80, Star DMP 510/515, Brother HR5, and also Amstrad DMP 1 with the CPC 464.

TASCOPY ZX Spectrum £9.90
TASCOPY 464 Amstrad CP 464 £9.90



TASWORD 464

The Word Processor

The Amstrad implementation of Tasword Two plus many extra features.

TASWORD 464 Amstrad CPC 464 £19.95

TASMERGE

The Mail Merger

Transfer data from MASTERFILE to TASWORD TWO! Letters and forms typed on TASWORD TWO can be printed with addresses and data taken from MASTERFILE. The mail merge facility allows, for example, multiple copies of a letter to be printed, each containing a different name and address taken from your MASTERFILE data. To use TASMERGE you must have one or more microdrives as well as TASWORD TWO and MASTERFILE by Campbell Systems. (version 9 or later).

TASMERGE ZX 48K Spectrum £10.90

TASPRINT

The Style Writer

A must for dot-matrix printer owners! Print your program output and listings in a choice of five impressive print styles. TASPRINT utilises the graphics capabilities of dot-matrix printers to form, with a double pass of the printhead, output in a range of five fonts varying from the futuristic DATARUN to the hand-writing style of PALACE SCRIPT. TASPRINT drives all dot-matrix printers with bit image graphics capabilities and can be used to print TASWORD text files. TASPRINT gives your output originality and style!

TASPRINT ZX 48K Spectrum £9.90
TASPRINT Amstrad CPC 464 £9.90

TASWIDE

The Screen Stretcher

With this machine code utility you can write your own Basic programs that will, with normal PRINT statements, print onto the screen in the compact lettering used by TASWORD TWO. With TASWIDE you can double the information shown on the screen!

TASWIDE ZX 48K Spectrum £5.50

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Plug into your Spectrum and drive any printer fitted with the Centronics standard parallel interface. Supplied complete with ribbon cable and driving software. The user changeable interface software makes it easy to send control codes to your printer using the method so successfully pioneered with TASWORD TWO. The cassette also contains fast machine code high resolution full width SCREEN COPY SOFTWARE for Epson, Mannesmann Tally, Seikosha, Shinwa, Star, and Tandy Colour Graphic (in colour!) printers. Compatible with microdrives and ZX Interface 1.

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ADD-ON EXTRA

DK Speech

DK'tronics
Speech synthesiser
Amstrad
£40

Now speech is available for the Amstrad with DK's neat synthesiser which uses a so-called plain English entry system and also has text to speech capability — but don't expect too much. The SLO-256 chip based unit also incorporates a stereo amplifier to boost the volume compared to the internal speaker.

Phloopy

Phi Mag Systems
Stringyfloppy
Electron
£123 or less

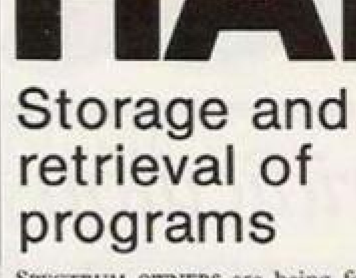
Phi Mag's version of the tape disc compromise — stringyfloppies are high speed tape cartridges like Sinclair's Microdrive which is emulate discs — now available for the Electron at £114 if you have a Plus 1 and £123 if not. This is includes drive, interface, cables, manual and cartridge. The same pack costs £99 for the BBC.

MFD 700

Sharpsoft
Disc drive
Sharp MZ-700
£287.50

Sharpsoft's 180K single sided double-density drive comes with inbuilt disc controller and a disc Basic which is compatible with Sharp S Basic. In use it leaves 31K user-Ram free in the MZ-700.

HARDWARE hitlist



Storage and retrieval of programs

SPECTRUM OWNERS are being faced with an ever increasing number of alternatives to the humble cassette. The three devices here all offer fast program storage at a reasonable price. The Sinclair Microdrive has been around for over a year now and has undergone various attempts to improve its reliability.

It has now appeared in a pack with the interface and some software called the ZX Expansion System priced at £100. The interface also has an RS-232 port and a network. The operating system is simple to use allowing programs and data to be saved on the Microdrive. Data is stored by opening a channel and then writing data to it. One drawback with the system is that some games cannot run with the interface attached, as the operating system will grab some of the Ram. The software comprises of the popular Tasword 2 word processor, a database, Ant Attack, Games Designer and a spare blank cartridge. The number of Microdrives can be linked up, each further drive costing £50. The cartridges cost £5 each and hold about 80K.

Along very much the same lines as the Microdrive comes the Wafadrive from Rototronics. The unit has two drives, RS-232 and Centronics ports and comes with two wafers and a word processor for £130.

Although noticeably slower than the Microdrive, this unit scores in several areas. It is said to be more reliable than the Microdrive and the operating system is more informative. The directory command gives more than a list of files like the Microdrive. The formatting command also gives a full report of the state of the wafer.



Unlike the Microdrive, it does not grab any workspace until initialised with a simple New* command. Also, should you wish to back-up a file from one drive to the other, you can do so without upsetting the contents of the memory. It saves data in a similar manner to the Microdrive.

In an attempt to make up for the slower speed, the wafers come in three sizes: 16, 64 and 128K. This obviously means that the average access time on the 16K Wafer will be lower. Thus you could load the main program from a 64K wafer in drive one, and have the data you wish to continually read and write on a 16K wafer in drive in two. The wafers are also cheaper at under £4 each.

Moving away from fast tapes to discs, the Beta Disk Interface from Technology Transfer allows you to interface the multitude of disk drives available for the BBC to your Spectrum. One point to bare in mind though, if the drive uses the Beeb's power source, you will need to buy a power supply.

Having got over that hurdle, the system is fast, user friendly, and of course, at £1.50, the discs are much cheaper than wafers or cartridges. The DOS has all the usual commands you'd expect and you can switch it in and out as needed. It even has a disc password system to keep your software from prying eyes.

You also get a free utility disc with the system with the various utilities they didn't have room for in the interface's Rom. The interface can be used with single or double density, single or double sided drives, and up to four can be connected to the one interface.

The system's major limitation at the moment is that data cannot be loaded or saved on disc, but Technology Transfer promise a new Rom in the new year and will upgrade existing units. The interface costs £97.25 for single density and £109.25 for double density.

Which of these systems you go for really depends on your priorities. Although the Sinclair product is the cheapest, the cost of the cartridges makes it less competitive. The cheapest medium of all, are the discs at £1.50 each. If you've got a collection of 40 discs or so, then the disc drive will have paid off.



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Star★chart

Tapper

Commodore 64
Bally Midway
Arcade
★ ★ ★

Released through US Gold, this is the official computer version of the arcade game, and very good it is too. You are a bar man serving somewhat dubious drinkers who are in the habit of slinging their empty glasses at you, and, should you not serve them quickly enough, instead of waving fivers under your nose, throw you the length of the bar.

Things get progressively worse as the crush at the bar gets bigger. Good sound and graphics, fast and addictive.

Run for Gold

48K Spectrum
Hill MacGibbon
Athletics
£6.95
★ ★ ★

Any more of these Olympics follow-ups and we'll be calling this Software Sportlist. But this one's different — for a start you don't have to drum the keyboard or turn your joystick to jelly and the Pole Position style view up the track encourages a feeling of realism.

The skill lies in balancing your speed against your reserves of energy. It's so real I was even tripped up Zola Budd style.

If you are in a really talented mood you can try your hand at the triple — 400, 800 and 1500 metres all in one day.

Strontium Dog

48K Spectrum
Quicksilva
Arcade adventure
£6.95
★ ★

Do not be fooled by Quicksilva's packaging and the fatuous blurb — although eminently playable this game is scarcely original. You will need to make a map and solve a few problems but otherwise it is simply a matter of travelling from room to room and blasting away.

SOFTWARE Shortlist

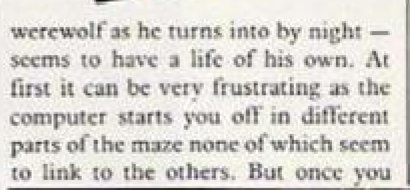
Knight's Lore

■*Spectrum*
■*Ultimate Play the Game*
■*Arcade adventure*
■*£9.95*
★ ★ ★ ★ ★

QUITE SIMPLY the most enjoyable game I have played since International Soccer on the Commodore 64.

Imagine Atic Atac in three dimensions and you will have some idea of what Ultimate's latest blockbuster looks like — but what makes Knight's Lore so different is the feel of the game. You have 40 days to complete your quest.

Under attack from manic ghosts, plodding guards and killer balls you have to pick up treasures, get over apparently insuperable barriers — usually by dropping treasures as stepping stones or moving around handily placed tables — make the best use of mysteriously moving blocks and map out the maze. People have been talking about arcade adventures for years but this is the first that requires good arcade skills and presents a series of problems to be solved within a satisfying whole.

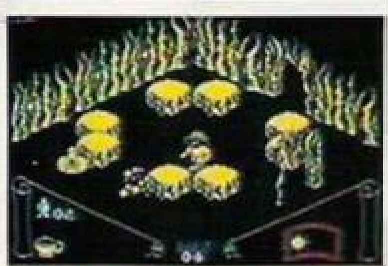


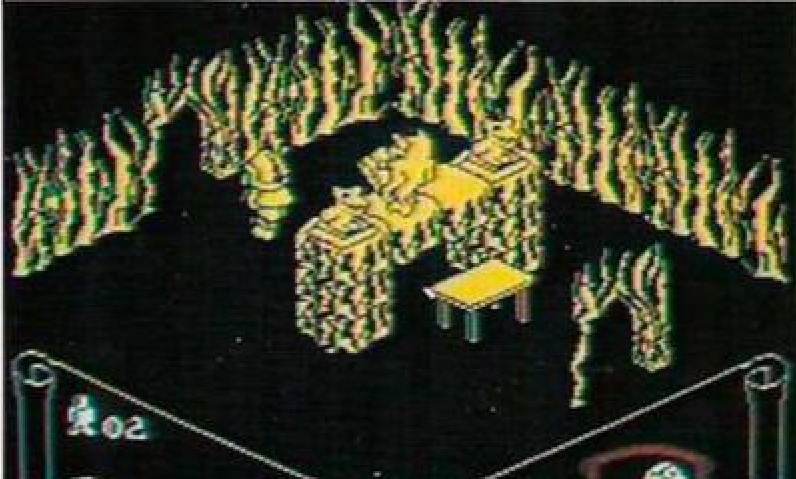
On screen your explorer — or werewolf as he turns into by night — seems to have a life of his own. At first it can be very frustrating as the computer starts you off in different parts of the maze none of which seem to link to the others. But once you make the connections and realise it is all set out on a 16×16 grid it begins to look solvable.

Yet again the feeble excuses software houses have been making for the weak games produced have been shown up by Ultimate.

Meirion Jones







3D Grand Prix

■*BBC B*
■*Software Invasion*
■*Racing Simulator*
■*£9.95*
★ ★ ★

FOR THREE years now, Pole Position has been regarded as the best motor racing simulator going. Now that Atarisoft have belatedly got around to converting it for the BBC, the program finds itself faced with very stiff opposition indeed from this program. What Dave Mendes and Mick O'Neal have done is to take the best features of Pole Position and go a stage further.

Although a great game, the old classic could not really be considered a simulation. Even Nicky Lauda never whizzed past the opposition in such easy style, on a good race you could pass over a hundred cars. Grand Prix puts a little fire in the bellies of the opposition, who now have no qualms about blocking your way very effectively; now getting in the lead and staying there becomes the challenge. There is also a complete gearbox as well as accelerator, brake and steering.

The game also avoids the pitfall of Chequered Flag, all these functions are accomplished with just five controls, so it is quite possible to keep the motor on the road with just a keyboard.

The graphics are excellent, with moving background, road markings, instruments and of course the other cars. The only criticism on this score is that the other cars do seem to approach rather quickly. The instruments are easy to read with a simple gear iondicator, speedo, rev counter and temperature gauge. The sound effects, consisting of the usual engine sound and the occasional — you hope — crash effect were a little on the loud side, but perhaps this is to induce driver fatigue — or at least ear ache — in a big race.

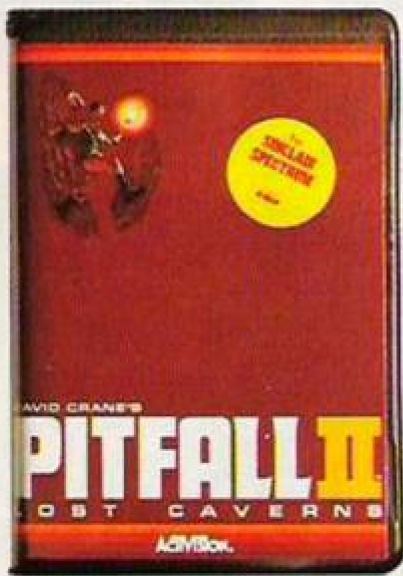
Our old friends the trackside signposts are still there for all the overtake on the grass freaks, but unfortunately they have rather shrunk so you can't easily see them coming.

Pole Position has retained its popularity for a long time and this successor will too. It is more demanding, requiring greater skill and patience.

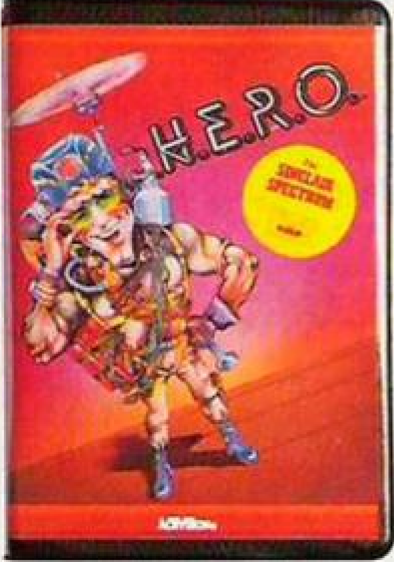
Lee Paddon

(continued on page 57)

The Activision Eight.



Pitfall Harry has to recover the priceless Raj Diamond from the lost caverns. But there is a small matter of poisonous frogs. Albino Scorpions. Vampire Bats. Electric Eels. Need we go on?
Running on Commodore 64, MSX, and Spectrum



Miners are trapped deep underground. Threatened by molten lava, poisonous bats, snakes, spiders. You alone in the person of Roderick Hero – Helicopter Emergency Rescue Operation – can help.
Running on Commodore 64, Spectrum, MSX



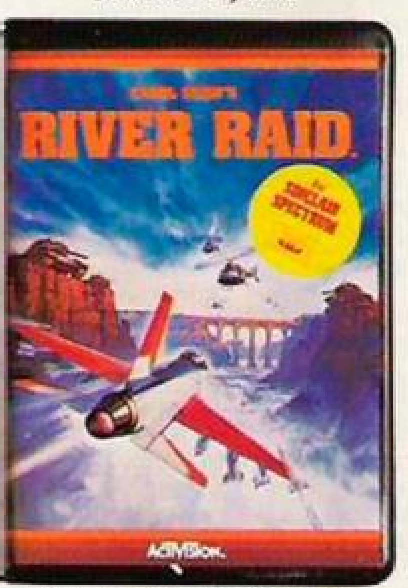
And you thought it was just a movie. But Ghostbusters is a computer game, too. Following the film with incredible accuracy. Even down to the chart topping music score.
Running on Commodore 64 and Spectrum. Soon on other systems.



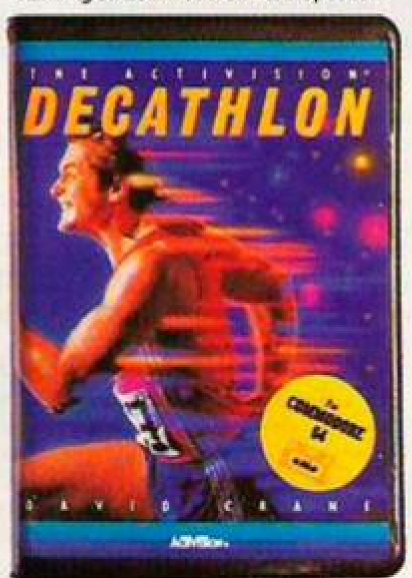
With the Designers Pencil, you can draw the world – and everything that's in it. Write your own melodies. Learn to write and develope your own programs. Its scope is as broad as your own mind.
Running on Commodore 64 and Spectrum



Man's ultimate journey. You can make it, in faithful detail, from lift-off, through an outer-space rendezvous, to landing. A genuine test of your inner strength.
Available soon for Commodore 64 and Spectrum



Stay cool. Stay low. Stay alive. Your mission is to fly down the world's most heavily defended river, destroying everything the enemy hurls at you. But beware... your fuel tanks are nearly dry.
Running on Commodore 64, Spectrum, MSX



Number one in the charts. And set to stay there. Decathlon asks for total commitment. Speed. Strength. Stamina. The will to win.
Running on Commodore 64



Merton the maintenance man is set for yet another routine night in charge of the toy factory. But something has gone terribly, terribly wrong.
Running on Commodore 64. Soon on Spectrum

Eight very different titles with one thing in common.

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For more details contact Activision (UK) Inc, 15, Harley House, Marylebone Road, London NW1.



Star chart

Backpackers Guide to the Universe

Spectrum 48K
Fantasy Software
£7.50

★ ★

A real Hitch-hiker's Guide to the Galaxy game is rumoured to be on the way from Douglas Adams. Fantasy have made an attempt to cash in on a cult — but the game and the name are mutually irrelevant. No jokes, primitive sub-Atic-Atac graphics. More complex than previous "Ziggy" games.

Havoc

CBM-64
Dynavision Productions
Shoot-'em-up
£9.95

★ ★

Graphics on the cover of this game are taken from the 64 version. This is highly misleading. Very bad use of blue and white in the Spectrum version renders this Zaxxon-type game hard on the eyes and exasperating to play. I would have raved about it two years ago.

Snow Queen

Dragon 32/64
Cambrian Computersolve
Puzzle
£5.95

★ ★

You have to save Kay from the icy grip of the Snow Queen. You do this by trying to pick out letters hidden in a frosty maze to spell the word "Eternity".

A.T.R.A.M.

Spectrum
Miles Bozeat
Wargame

★

First in a new generation of computer wargames. A rather boring board game is made even more tedious by having to enter the moves into the computer. The computer is used as a bookkeeper, the same function could be accomplished with a piece of paper and a pencil.

SOFTWARE Shortlist

(continued from page 55)

Ghostbusters

- *Commodore 64*
- *Activision*
- *Sweep'em-up*
- *£10.99*

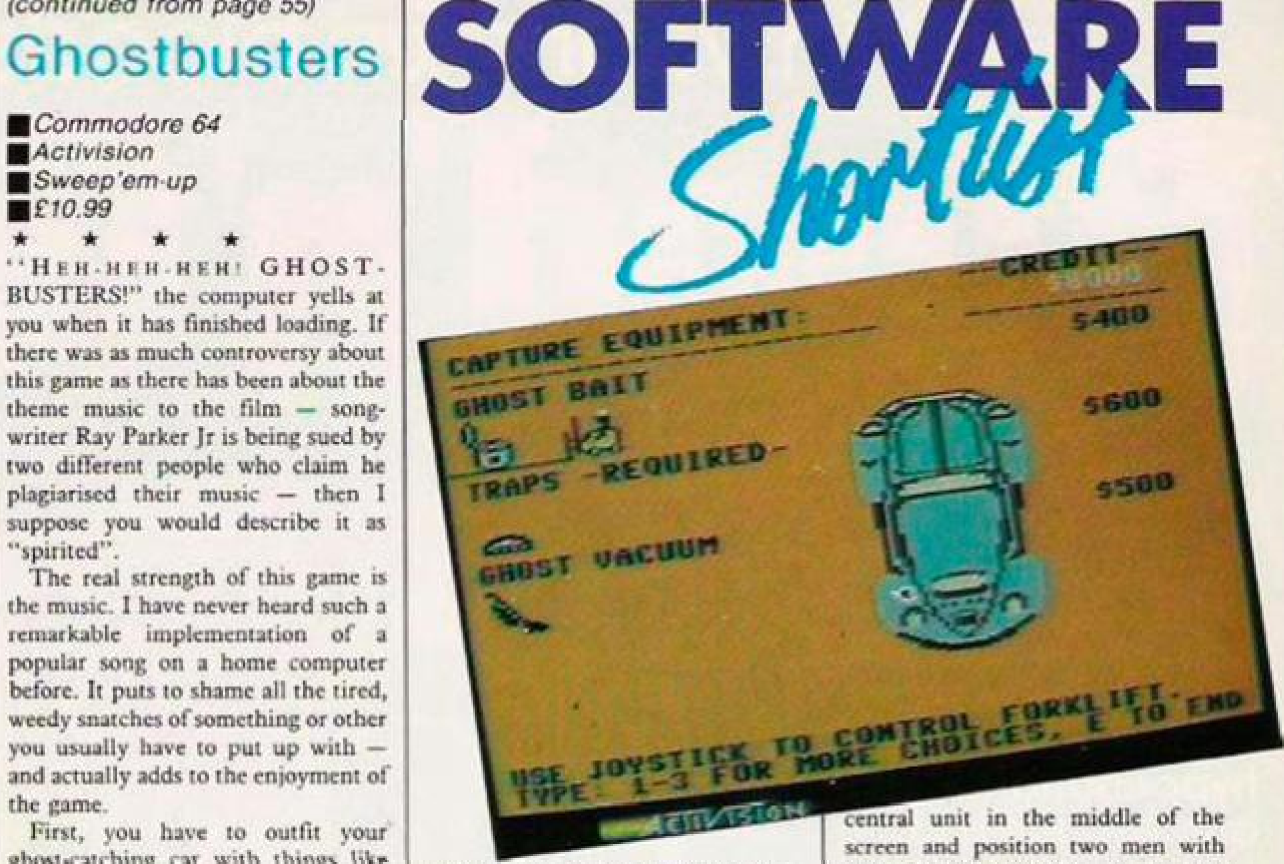
★ ★ ★ ★

"HEH-HEH-HEH! GHOSTBUSTERS!" the computer yells at you when it has finished loading. If there was as much controversy about this game as there has been about the film — songwriter Ray Parker Jr is being sued by two different people who claim he plagiarised their music — then I suppose you would describe it as "spirited".

The real strength of this game is the music. I have never heard such a remarkable implementation of a popular song on a home computer before. It puts to shame all the tired, weedy snatches of something or other you usually have to put up with — and actually adds to the enjoyment of the game.

First, you have to outfit your ghost-catching car with things like energy detectors, image intensifiers, marshmallow sensors, ghost vacuum, ghost traps, ghost bait and a laser confinement system. You have to search for, catch and store ghosts and you can literally turn your demons into dollars. It's like a sort of Pac-Man in reverse where you chase the ghosts.

The screen display shows a maze map of New York. Afflicted blocks shine red. You direct your Ghostbusters symbol to the block. Take the shortest route possible because the screen changes to a top view of your car cruising along the highway, vacuuming up any of the ghosts you froze en route to the



trouble spot on the previous screen.

There are one or two things insufficiently explained in the on-screen instructions — sometimes it says things like press space when it means press Return, and if you don't collect any traps when you're outfitting the car the game falls into a kind of loop which might lead the unwary to think they had purchased a faulty copy. Most of these problems can be overcome by examining the minute instructions minutely and using a little horse sense.

Another part of the action necessitates positioning the laser confinement system to catch Slimers. Using the joystick, you drop the central unit in the middle of the screen and position two men with lasers on each side of it. At the right moment you can suck down the spectre; if you miss, it attacks one of the men who cries out pathetically "He slimed me!"

Finally, you can sneak two Ghostbusters into the Temple of Zuul for the final battle.

If you are successful in this uniquely American commercialisation of the spirit world, you get your own Ghostbusters franchise and a secret number which you can use the next time you play the game. Apparently you can use this number on any version of Ghostbusters anywhere in the world. Eerie, huh?

Paul Bond

Travel with Trashman

- *Spectrum*
- *New Generation Software*
- *Sweep'em-up*
- *£6.95*

★ ★

GARBAGE IN, GARBAGE out, as we used to say at break — but Travel with Trashman is a worthy successor to the first Trashman game although not as visually revolutionary as some of the computer games we have looked at this month.

The first screen shows all the cities of the world that Trashman can travel to — but it all costs money. You can travel to America, Spain, Paris, Munich and finally, Jerusalem.

In Paris you have to collect a load of tiny bouncing green dots which are meant to be frogs loose in a cafe. If you bump into a waitress while endeavouring to recapture the rogue amphibian appetisers you lose points. In New Orleans you have to gather up money thrown at a marching jazz band, in Munich you collect the empties after a beer



festival.

The deadliest early job is in Spain — and Trashman is not even a football supporter. To show their appreciation of British sanitary technology the Spaniards get Trashman to pick up roses in a bull-ring — while the bull is still in it. A news report about Trashman being killed in Spain is mysteriously followed by the information that you are stranded there without money.

If you do get Trashman to Jerusalem, his job is to mop up tears at the Wailing Wall. So, if you missed giving this game to someone for Chanukah, there's always the Jewish New Year. But I think New Generation are going to have to put in a lot of work on their graphics and brush up their ideas for games if they're going to keep ahead of some of the excellent stuff being produced by companies like Ultimate Play the Game, US Gold and Beyond Software.

Paul Bond

(continued on page 59)

A fantastic fight to the death within your own bloodstream...

Blood'n'Guts



...Through the miracle of Dr Hackers REDUCTO-RAY you find yourself inside the body of a very sick hypochondriac Your only escape is to reassemble your submarine which has broken into eight pieces and distributed itself around the body. Not for the weak at heart!

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and leading multiple retailers and specialist computer stores.

Star★ chart

Psi Warrior

Commodore 64
Beyond
Shoot-'em-up
£9.95
★ ★ ★

The Psi warrior travels on his psi mat in the enemy silos, going to confront The Source. Nice bit of atmospheric setting, but it is really just a shoot-'em-up type maze game. The graphics are very nice even if the ethereal baddies are kind of odd sploges on the screen.

Espionage

Spectrum and Commodore
Modular Resources
Adventure
£8.95
★

You have to catch the mole in your oil company before he gives away the company secrets. You do a Bobby Ewing impersonation — this is done by answering questions of a petrochemical nature and sussing out which of the people asking the questions is the phoney.

Crypt Capers

BBC B
Software Projects
Maze
£7.95
★ ★

Utterly unorigional maze game on the now familiar Egyptian theme. There are 12 screens to complete before you reach the Pharo's chamber. On the way you have to collect such items as keys, jars and papyrus roots while shooting or avoiding a variety of nasties.

Valkyrie 17

Spectrum 48K
Ram Jam Corporation
Adventure
£9.95
★ ★ ★

A graphics text adventure tracking down Nazis who, as they are wont to do, are busy trying to take over the world. A few enigmatic clues are provided by the packing and a soundtrack on the cassette. Plenty of humour and terrible German accents.

(continued from page 57)

Raid Over Moscow

■*Commodore 64*
■*US Gold*
■*Shoot-'em-up*
■*£9.95*
★ ★ ★ ★

GOOD GAME, SHAME ABOUT the propaganda. Raid over Moscow has some excellent graphic sequences which make Zaxxonesque games appear relatively flat. Sadly, the scenario is set in the near future, just after the Salt IV arms reduction agreement between the US and the Soviet Union. Since Americans can't even get the past right — witness the "Royal Marine Spitfire"(!) in US Gold's Spitfire Ace, or the World War One RAF(!) biplane in Atari's Blue Max, we can hardly place much faith in their perception of the future.

You are the commander of the only fully operative US space station carrying Stealth aircraft — undetectable by radar. Both countries are supposed to be dismantling their nuclear stockpiles but, because the Soviets can't keep up with the new defence technology, they have hung on to a few old warheads for a rainy day. Inflamed by watching John Milius moves like Red Dawn, they decided to launch a sneak attack.

"The Soviets believe their treachery will lead to world domination", it says on the inlay. However, instead of invading Grenada or some underequipped South American democracy you, the Yank, decide to strike at the very heart of the Russian bear himself.

First screen shows the missiles leaving their bases in Minsk or Saratov and wending their way to Miami or even nuclear-free Montreal. It tells you how much time you have left to save the world. The second screen shows you the space-station hangar. You have to hit a key to get the hanger doors open as well as manoeuvre the Stealth craft with your joystick but it is an excellent 3D representation, with the pilot tromping determinedly to his ship like Sam Shepard in the Right Stuff. Unfortunately, before I discovered the key I wasted a few goes trying to fly into the pilots' locker room.

Once you've got a few ships into space — and one or two into the officers' mess — you are in a position to confront the armed might of those sneaky Reds.

Beach-head-style you return to the first screen and position the cursor over the attacking city. Then you go into low-level attack. There are three screens of Zaxxon-style action where you fly over farmhouses shooting up schoolbuses, into Siberian wastelands blasting pillboxes — very tedious screen, this — and around command posts with tanks and lorries.

Your aircraft casts a shadow — the Russian ones don't; perhaps that's as far as their Stealth technology could get — but you can bank and veer to your heart's delight. Ground vehicles are very convincing indeed.

The final screen is a kind of shoot-out in Red Square where you zap armoured vehicles with a bazooka.

Essentially a suite of games rolled together in one scenario, one can only say that it is a pity that such an apalling scenario was chosen. It is dangerous because it assumes that the Russians are evil — it is one thing for school children to knock hell out of a fictional enemy it is quite another to ascribe subhuman characteristics to a real people, with a real history and culture.

US Gold are very smug about this issue, saying essentially that no publicity is bad publicity; but like old man Reagan keeps repeating; "You ain't seen nothin' yet."

Paul Bond

SOFTWARE *Shortlist*





Cyclone

■*Spectrum 48K*
■*Vortex Software*
■*Rescue game*
■*£6.95*
★ ★ ★ ★

HELICOPTER GAMES are all the rage at the moment what with combat Lynx and Tomahawk — even Fort Apocalypse. But Cyclone from the people who brought you Tornado Low Level is a breath of fresh air. It has the excellent 3D graphics of TLL, with a much more praiseworthy motivation for the action.

You control a helicopter which has to recover medical supplies from islands in the path of an advancing cyclone. The screen display gives you a god's-eye view of a helicopter crouching on the pad. Press 1 to take off, O to P to rotate. The right-hand side of the screen shows your altitude, fuel, speed and direction — by pressing M you can call up a map which shows you the islands, the cyclone and a real-time plot of where you are.

Naturally, the air is full of planes fleeing the oncoming cyclone so watch out you don't collide with them. Your helicopter also becomes difficult to control as the windspeed strengthens. As you wrestle with the controls, the urgency of your mission is emphasised by the pathetic figures below you, waving for help. Unlike Choplifter, the pathetic figures don't seem to leap into your egg-beater when you put down but the goal of this game is to find five crates of

(continued on page 61)

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Star★chart

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£9.95
★ ★

Provides five simple games, which purport to test for clairvoyance and precognition, together with questionnaires which assess your psychic potential. If, like most of us, you turn out to have no psychic ability you will find the games dull and frustrating.

The questionnaires brand believers as sheep and sceptics as goats but you might also feel a bit goatish about whether computers are at all suitable for testing psychic abilities.

Fall Guy

Spectrum 48K
Elite
Arcade
£6.95
★ ★

Ever wanted to be a TV stuntman? Well now's your chance. If the job is anything like the game then don't bother. It consists of jumping off variously shaped objects, and with a bit of luck falling on another similarly shaped object. You have five "takes" to make 20 successful leaps, complete the screen, and, you've guessed it, you get something else to leap off. All this is done against the clock as the films budget runs out. Nice graphics, shame about the game.

P.C. Fuzz

Commodore 64
Anirog
Beat-'em-up
£7.95
★ ★ ★

Our friendly neighbourhood flatfoot is having a tough day. Not only are there the usual punks and drunks to deal with in his usual caring manner, but the mafia has come to town and intends to clean up in the bank minding business. All this and only a monocycle and a truncheon for protection.

(continued from page 59)
medical supplies.

You can switch from a North view to a South view when searching for crates. You hover directly over a crate to winch it aboard, and refuel at nearby landing pads to keep flying.

You have to land very gently indeed and his can be tricky when battling headwinds.

Paul Bond





Mr Ee

■*BBC Micro*
■*Micro Power*
■*Arcade*
■*£6.95*
★ ★

THE MOST NOVEL thing about Mr Ee is its title. Unfortunately, there is no mystery about the game itself which is yet another version of the arcade game Dig Dug. In other words it is one of those games where you have to dig tunnels through the earth and collect desirable objects. In pursuit is a pack of hostile creatures which you can crush by dropping apples on them.

Mr Ee is, admittedly, a highly refined version of the game with 12 different screen layouts, excellent graphics, and a maddeningly jaunty fairground tune. If you choose to fight rather than flee, as an alternative to dropping apples you can release a crystal ball. This carries on bouncing along the tunnels until it hits something.

There is also a larger cast of creatures than usual — Umphs, Diggers, Letter Monsters, and Maras. When you eat a lump of food the Maras troop on to the pitch as the Umphs and Diggers freeze. But the game is still Dig Dug for all that.

It is a pity Micro Power did not give the action a more original twist. US Gold's superb tunnelling game, Boulder Dash — for the CBM-64 — takes up where this game leaves off. And once you have played Boulder Dash you won't dig Dig Dug no more.

Simon Beesley



Battle through time

■*Commodore 64*
■*Anirog*
■*Shoot-'em-up*
■*£7.95*
★ ★ ★

TRUNDLING ALONG in a rather innocuous looking armed, all terrain vehicle, your mission is to help mankind with the wholesale slaughter of his enemies. Whose side you're on isn't actually specified. Anyway, you have travelled back through time and your first job is to wipe out biplanes in World War 1 without getting bombed or falling into bomb craters.

Every so often artillery appears on the ground which gives you bonus points provided you run over it. You have vertically and horizontally firing runs to kill the enemy in the sky and shoot at rocks barring your way on the ground.

After you have survived 10 miles of this — indicated on a panel at the bottom of the screen — you are teleported into World War 2 in which a similar scenario ensues.

Another 10 miles and you are pitched into the heart of the battle in Korea with enemy jets firing rockets at you to the accompaniment of the theme from Mash. Next, you find yourself in Vietnam where helicopter gunships are dealing the proverbial death from the skies. Survive this and you must help to win World War 3. Blue clouds fire bolts of lightening at you and black crab-like craft do their best to scatter your component parts. Having survived this mayhem, mushroom clouds sprouted all over the screen and I was told that I was responsible for the destruction of the planet — a heavy burden to bear. However, I got the chance to redeem myself by fighting war mutations.

The last screen I reached was "In the beginning ????BC" with pterodactyls swooping down and little men on the ground throwing spears, boomerangs and clubs — yes, my armed, all terrain vehicle was even threatened by these primitive weapons. Anyway, the idea is to kill the men but not the pterodactyl — it can only be frightened away by firing at it before it reaches the ground so that it goes various shades of puce and retires in disgust.

The game has lots of different music to go with each screen as well as a high-score table, two-player option, two skill levels and a continuous play facility.

Ian Vallely

(continued on page 63)



Star★ chart

Zen Assembler

Amstrad
Kuma
Utility
£19.95

★ ★ ★ ★

One of the best assemblers available, Zen has been around for some time on a variety of Z-80 micros. This version also benefits from an excellent disassembler which provides labels, and a full machine code monitor with the facility for inserting breakpoints.

Styx

Oric/Atmos
No Mans Land
Arcade

★ ★

Four screens of swooping aliens to annihilate. Mines are dropped which can impede movement. Fast and noisy but rather unoriginal, addicts only.

Drelbs

Commodore 64
US Gold
Arcade/Strategy
£9.95

★ ★

At first sight the screen looks like a multi-coloured printed circuit board made up of gates which you can rotate to form squares. But then you notice the traditional video nasties — refugees from so many other games in hot pursuit.

With skill you can box them in and if you complete enough squares go on to another screen. If it had appeared in the summer of 82 it might have earned rave reviews, but in 1985 it looks a little bit tired.

Zombie Zombie

Spectrum 48K
Quicksilva
Novelty
£6.95

★ ★ ★

A new game from the author of Ant Attack, which uses the same superb 3D effects. Once again you find yourself roaming around a ruined city, now fighting off zombies rather than ants. This time you can also fly over the city in a helicopter, pick up and transport bricks.

(continued from page 61)

Underwurlde

- *Spectrum 48K*
- *Ultimate Play The Game*
- *Arcade adventure*
- *£9.95*

★ ★ ★ ★

DROPPING INTO the Long Dark Palace on your way to freedom is just about as easy as negotiating a no-strings-attached pact with the devil. It could be well into 1985 before you have developed enough gremlin-zapping skills, a detailed knowledge of Underwurlde's vast labyrinth and tempered all that with a good deal of luck.

Underwurlde is an arcade adventure in the classic Ultimate mould. As in the horror movie *The Amityville Horror*, your sabreman's house seems to be a bijou residence in need of some modernisation — it's been built over a gateway to hell. Instead of rising damp, your basement is seeping all sorts of nasties, up for a night out from the Well of Evil.

With noisy neighbours like that, you can probably guess that escaping is not easy, especially as you have to go down to the devil's lair in order to climb up again to freedom.

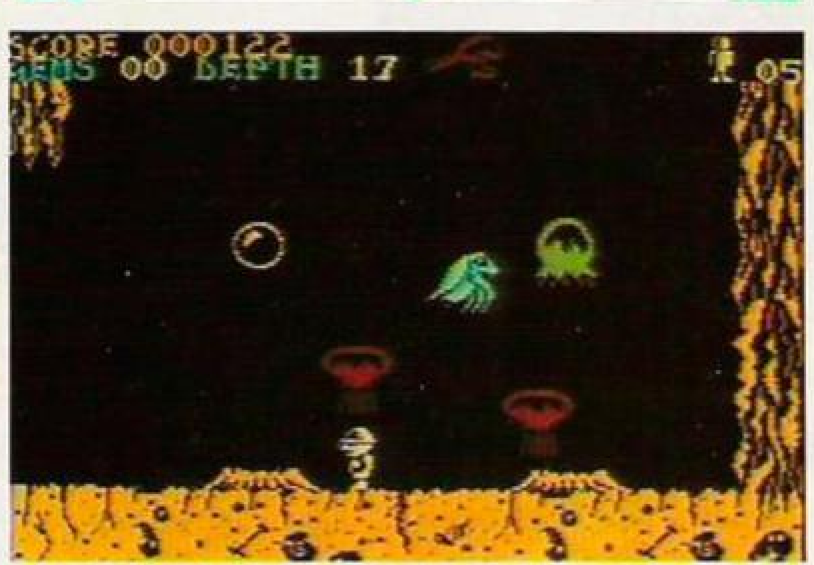
SOFTWARE *Shortlist*

You have a side-on view of the action, unlike Knight Lore's 3D angle or Atic Atac's ceiling perspective. So if you miss your footing you can watch as your man tumbles past gallery after gallery to his death. The correct technique to use if you don't want to squander valuable lives in the early part of the game is to lower yourself down by rope and rise up again on the giant bubbles of inert plasma. Magic gems make you invincible for short periods so they are worth grabbing whenever you can.

Weapons are absolutely indispensible if you want to make any progress at all. The catapult you find at the very start of the journey will only take you so far; you'll need daggers to cut your way past the guardians of the nether reaches of the Underwurlde.

Toby Wolpe









Interview

- *Commodore 64*
- *Front Runner*
- *Arcade Adventure*
- *£7.95*

★ ★ ★

PART OF THE new wave of three dimensional maze-style games on the Commodore 64, Interview has that secret ingredient — added Hungarian programmers — which seems to be the touchstone of success for so many new computer games in Britain today.

The game is a race against time. You must reach a job interview punctually. Unfortunately, your journey to the office is dogged by disaster. The first screen shows a close-up, rear view of our hero walking down the street. Using the joystick, guide him around open manholes, banana-skins, dogs, pedestrians and out of the path of falling flowerpots.

The second screen shows an aerial view of the city. You must guide the interviewee from the bank where he has presumably just cashed his dole cheque to the site of the interview. The money is important, because you may have to repair your tarnished image, once the dogs and what-have-you have all had a go at you.

It is possible to waste your money — most significantly in video arcades and computer shops. We feel there is a deep moral message here. Restaurants and coffee shops don't benefit you particularly, either. Should you fritter away your DHSS money, you will have to traipse all the way back to the bank to get more money in the event of getting run over or falling down a manhole. In real life of course you would be able to take legal action against the local authority for leaving an entire street full of uncovered manholes.

There are a number of things which you need to do to get through the interview — this is the real strength of the game, quite apart from the excellent graphics. For example, if you get knocked over three times you should go to the shoemakers. Otherwise you will get a no-no letter in the post, telling you why you failed.

The third screen shows the receptionist — then a letter comes up on screen, usually telling you why you failed to get the job. But if you are lucky enough to have prised yourself free from the poverty trap, the computer then shows you a view of your nice new office. Lo and behold, it's even got a CBM-64.

Paul Bond

(continued on page 65)

University Software

UNISTAT

STATISTICAL PACKAGE

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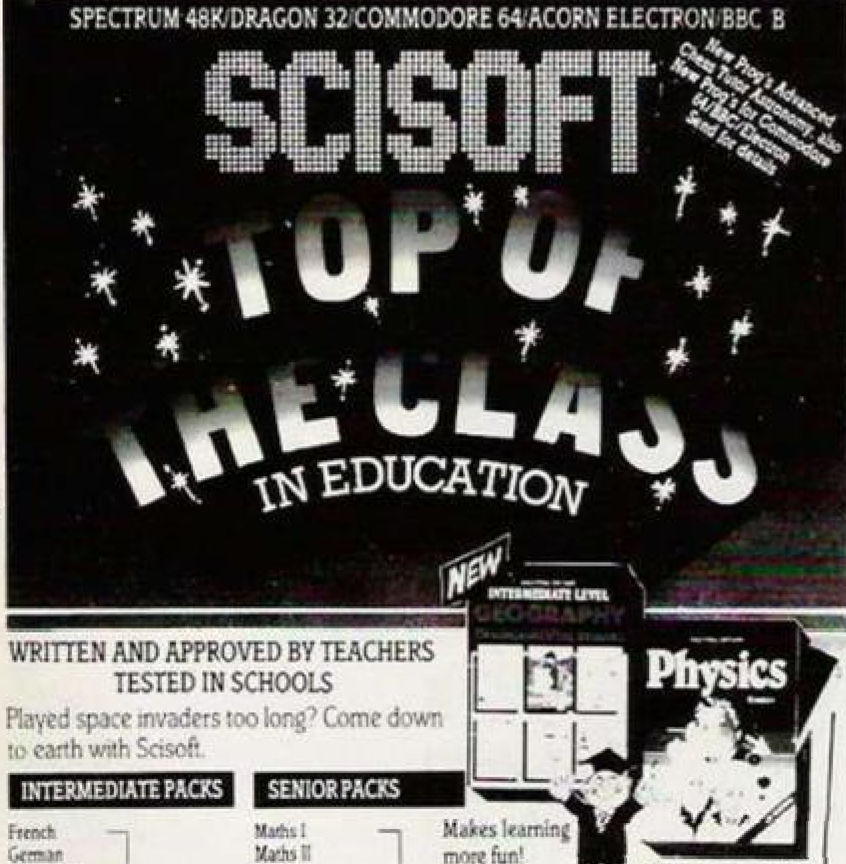
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Star★chart

Designer's Pencil

Commodore 64
Activision
Graphics Designer
£11.99

★ ★ ★ ★

There are already a number of drawing and painting programs for the CBM-64 but this is something different.

Completely menu driven it provides an extensive but simple Logo-style programming language. Selecting a command is just a matter of nudging the joystick. There is also scope for freehand drawing and adding sound.

When you have entered your program a moving pencil rapidly draws your picture. Great fun to use, these facilities are exceptionally well implemented.

Trouble in Store

Oric 1/Atmos
Orpheus
Platform
£6.95

★ ★ ★

Ten screens to complete in this platform game. There are no conveyor belts or crumbling ledges but a good assortment of mutant tvs, flared trousers, flamingos, and suchlike, along with a tremendous ragtime soundtrack. On the Spectrum this would be nothing new but by Oric standards it is good value.

Pacmania

Commodore 64
Mr Chip Software
Gobble-em-up
£5.99

★ ★

As far as graphics and speed are concerned this Pacman variant is superior to Atari's version. But it contains an alarming feature which Pacman purists will deplore. At the touch of a key you can disappear and re-materialise elsewhere in the maze; in other words, a hyper-space option. Whatever next? How long will it be before we see Pacmen armed with missiles or smart bombs?

(continued from page 63)

Lode Runner

■ *Spectrum 48K*
■ *Software Projects*
■ *Platform game*
■ *£9.95*

★ ★ ★

THERE IS A JUSTIFIABLE awe of American software in this country with consistent scare stories being put about by the computer trade press that this particular software invasion will do for British companies what a cruise missile would do for Minsk.

This is a Broderbund game under license — and Broderbund brought us the memorable Choplifter on the Apple II and in various forms for other home computers.

Sadly, this is unlikely to set the world on fire. All of that blurb about being a highly trained Galactic Commando deep in enemy territory is not going to disguise the fact that this is just another platform game, albeit complex and with neatly executed graphics.

In the traditional way, you climb ladders, grab gold, swing on ropes — nice touch, this — and dig holes to get rid of your assailants. Later screens involve you in passage-way mazes and necessitate a certain amount of drilling with your laser pistol. The real strength of this game is that, like Beyond's Mr Robot, it is also a game generator. You can stick in loads of ladders, floors, trap doors, gold bars and enemies as you like.

So, while not being part of the striking graphics trend, this game may well turn out to appeal to a new market for "kit" computer games.

Paul Bond

SOFTWARE Shortlist



NLQ

■ *BBC Micro*
■ *Watford Electronics*
■ *Utility*
■ *£18.40*

★ ★ ★ ★

IS YOUR Epson printer beginning to show its age? Do you hanker after those new printers with fancy type styles? If you have a BBC Micro, you could revitalise your RX or FX model without breaking the bank by adding Watford's NLQ package.

NLQ — it stands for "near letter quality" — comes in an 8K Eprom, which fits not in the printer but in one of the paged Rom sockets of the computer. From there you can call it from Basic or even through commands set in Wordwise text.

Besides plain text printing, NLQ offers some trick features: proportional spacing, underlining, enlarged letters or all of them together. A built-in help page provides a ready reminder of the codes to type.

Printing is somewhat slower with NLQ: to give high resolution the print head has to make at least two passes of every line. And it's a little noisier because of the extra line feeds.

There's a limit to what can be squeezed into 8K, of course, so you don't get an italic font; but you do get some exotica and there is a choice of crossed or plain zeros.

Since printing is carried out in a graphics mode, the proportional spacing feature works even on the RX range of printers. The Rom claims a workspace in page &A00 but this can be moved easily if necessary.

Besides plain text printing, NLQ offers some trick features: proportional spacing (see?), underlining, enlarged letters or all of them together. A built-in help page provides a ready reminder of the codes to type.

Doomdarks Revenge

■ *Spectrum 48K*
■ *Beyond*
■ *Adventure*
■ *£9.95*

★ ★ ★

SO YOU THOUGHT Lords of Midnight was difficult? This, the latest in the series makes its predecessor look like a bunfight in a Brighton tea-room.

The game is a graphics adventure featuring the unique "landscaping" feature which very quickly draws in the features in front of your character. There are 6,000 locations altogether and over a hundred characters, making it vastly more complex than Lords.

Obviously, Mike Singleton has decided that having whetted your appetite, he must now give the punters a real run for their money. For a start, you only have the bare outlines of the map given to you and the characters are far more complex than before.

Every character you meet, instead of being simply friend or foe is trogging around the place bent on his own little scheme, and if you go up to him suggesting he might like to join your merry band, he may either join you, ignore you or turn on you.

The plot is that after the defeat of Doomdark, his daughter is bent on revenge and seduces Luxor's son Markin and takes him off to her castle in the frozen empire. Luxor rides off in pursuit to rescue his son.

The politics of the place are far more complex than Midnight, there are five kingdoms, each of which dislikes the other to a certain degree. These rivalries must be exploited by Luxor.

This game is a worthy successor to Lords of Midnight. Mike Singleton hasn't just revamped the plot and changed all the names, he has given us a logical extension of the LOM system with many improvements and refinements. The player has a whole set of new problems and victory conditions to achieve and I'm sure all LOM fans will want to add this one to their collection.

Lee Paddon

•• MAY WICO BE WITH YOU ••

When you're up against all the evil in the universe, you need the finest joystick. Weak, sticky, slow controls can only lead you to your doom.

You need a Wico.® The controls in more than 500 modern arcade games are actually made by Wico.® They set the industry standard for durability and performance. And the same arcade quality goes into the Wico® you take home.

Wico® joysticks work directly with the Commodore 64,™ Vic 20,™ all Atari® Home Computers and Atari® Video Games.

Add an interface, and you can connect into a Sinclair Spectrum or Apple II® and IIe.® If you have a new MSX computer there's the just released MSX Grip Handle for you.

What do you get? A man-sized handle on a virtually unbreakable shaft. Tough, ultra-sensitive Wico® switchgear. A heavy-weight base. A year's guarantee. And more sheer dodging, chasing and blasting power than ever before.

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Ask your dealer to let you handle a Wico.® Quality (you'll find) costs money.

But if you want to have less trouble fighting your controls, and more power for fighting the forces of darkness . . . only Wico® is worthy of your hand.

WICO®

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CGL HOUSE, GOLDINGS HILL, LOUGHTON, ESSEX IG10 2RR. 01-508 5600. LOOK FOR THE WICO NAME IN ALL GOOD SHOPS AND CATALOGUES.

QUEST Corner

NEWS
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The crystal ball

The latest release from those master adventurers at Infocom is The Hitch Hikers Guide To The Galaxy. This hilarious radio series subsequently appeared on TV, in book form, on record and even as a stage play. It just had to become a computer text adventure.

Written by Douglas Adams, the original author, and programmed by Infocom, HHGG is a completely new tale in the Arthur Dent saga. It promises to be both challenging and comical. On disc only and likely to be priced at around £40, HHGG will be available for Atari, Apple and Commodore 64 micros.

A helping hand

If, like Ian Fisher of Huddersfield, you're sinking into the pits of despire over ZORK I, read on.

Can't cross the rainbow in Frigid River Canyon? ERTPECS EHT EVAW

Grating in the forest clearing unlockable? EZAM EHT NI EN OG — WOLEB MORF DEKCOLNU EB YLNO NAC TI

Mr A. Lusher of Kent cannot find the large emerald in ZORK I. YOUB EHT EDISNI KOOL

Some players are finding it tough to get going in Artic's Espionage Island.

Can't escape from the plane? ARAP PARTSNU : DROC LLUP : REVEL LLUP : ARAP RAEW : ARAP TEG

Richard Shepherd's Urban Upstart is causing a bit of head scratching.

Building site a problem? RAEWTOOF TUOTS DEEN UOY

Football fan giving trouble? KNIRD A MIH REFFO : SFRACS GNISOPPO DIOVA.

Yours in traps and terros,
HUGO NORTH

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.

Return to Eden

Various
£9.95
Level 9

THIS IS Level 9's sequel to the smash-hit Snowball. As ever with this company's adventures, the plot is exciting, the prose detailed and imaginative, the locations numerous — over 250 — and the adventure awash with stimulating puzzles.

Forced by damning evidence to flee from the interstar transport Snowball 9, Kim Kimberley is the first human to land on the Planet Eden. However, Eden is not uninhabited but populated by robots who live in an eastern city which is constantly under attack from hostile beings of all types. Will the good name of Kim Kimberley be cleared? Will Kim even survive? Play on!

For the first time, Level 9 have included graphics — but only if you've got a Commodore 64, Spectrum or Amstrad. For the rest it's text only, though the BBC B version has a separate program displaying the picture. Not being a company to stint on quality or quantity, they have crammed in about 240 first rate and fast drawn pictures. If you buy no other adventure, you must buy this — Level 9 have come up trumps again.

The Wheel of Fortune

BBC B
£9.95
Epic Software

TO COMPLETE this roundup of excellent adventures comes, appropriately, The Wheel of Fortune. Containing both graphics and text, this adventure has an interesting plot and many impressive features. Here's a few to whet your appetite: 250 locations, every one with a rapidly drawn, half-screen picture; a sophisticated command analyser allowing complex input and swift response; intelligent characters who live in real time and who can be talked to and asked questions of; a function key set-up facility accessible from within the game itself. Definitely one to feed your Beeb.

Cuddles, and Ice Station Zero

Spectrum 48K
£1.75
Eighth Day Software

NOW TO WHAT must the adventurer's bargain of the year. Eighth Day Software have released a series of Quilled text adventures for the 48K Spectrum, and each of them only costs £1.75. You'd be forgiven for thinking that they can't be much cop for that sort of money — but you'd be dead wrong. The adventures are good quality with interesting themes.

For example Cuddles has you as a precocious baby trapped in a playpen, guarded by a nanny and with nothing but a bowl of sloppy food and a building block to experiment with. In Ice Station Zero you're on the trail of an international terrorist who is holed out in a polar research station yet holding New York to ransom.

Other titles in the collection are Quann Tulla and, the two most difficult, Faerie and Four Minutes to Midnight. Available only by mail order from Eighth Day, 18 Flaxhill, Moreton, Wirral, these adventures are excellent value for money.



Danger Mouse in the Black Forest Chateau

Various
£7.95/£6.95
Creative Sparks

BACK TO GRAPHICS and text adventures, Danger Mouse in the Black Forest Chateau is just the thing for the younger or novice adventurer. The graphics are delightful featuring as they do those lovable heroes, Danger Mouse and Penfold.

Entering commands couldn't be simplier; you're presented with a choice of actions at every stage. Select the one you want and the story progresses. The adventure is in two separately loadable parts: you can't start part two until you've finished part one. Danger Mouse is a non-violent, warm and humourous adventure.





ORIC'S NEW WAVE

ON THE STARTING BLOCKS in Oric's Cambridge based research and development department are five new computers and the company is brave enough to believe that it can launch at least three of them by next summer.

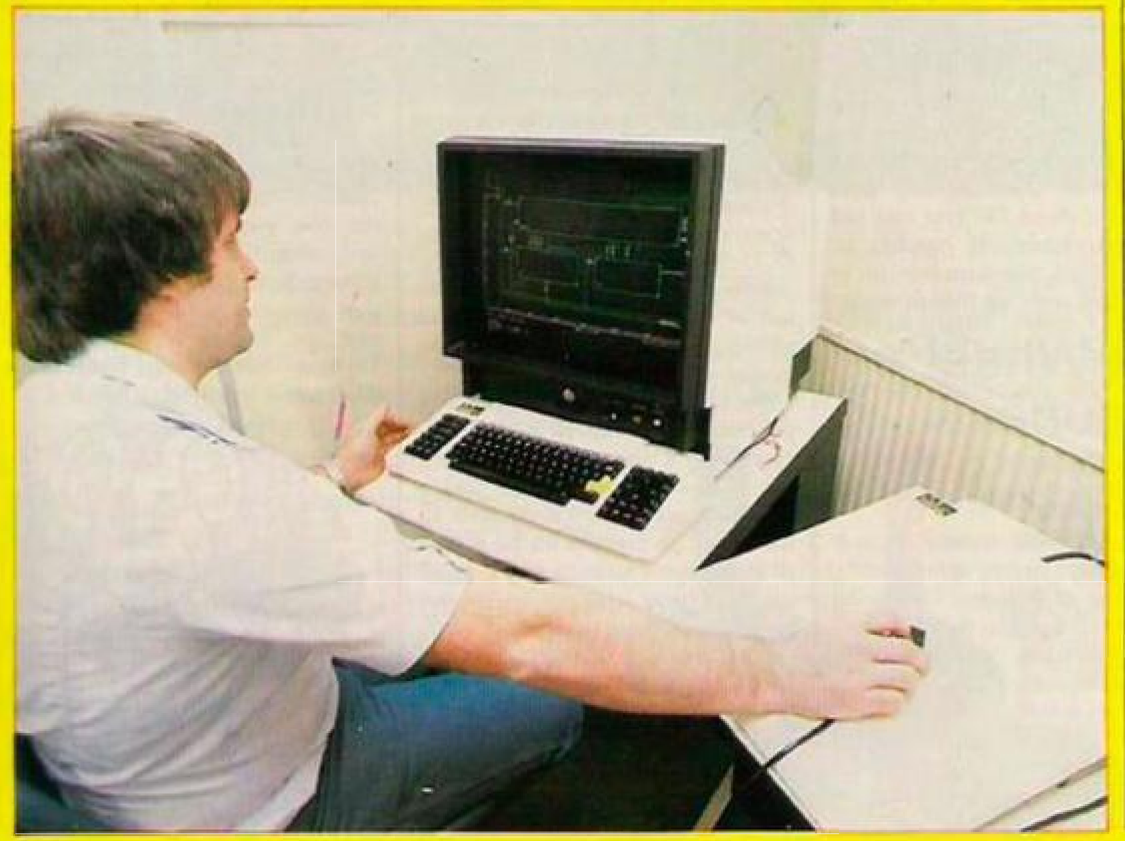
They range from the Stratos, a £200 machine based around the Atmos, through an MSX, to a QL-style 68008 computer, with an IBM PC compatible and a lapheld at the top of the range. Ambitious indeed considering that since the launch of the company with the Oric 1 over two years ago the only new computr from the company has been the Atmos — a revamped Oric 1.

Although 1984 was the year that Oric almost disappeared from the British micro market, confidence for 1985 is based on two assets, a booming European sales — in France even in the sleepiest villages a card in the window of every moped repair shop invites you to buy an Oric Ordinateur Individuel — and expertise in uncommited logic array design.

How long can Oric old hand Barry Moncaster keep that long wheel base Mercedes hidden from dark-suited Bruce Everiss.

Using ULAs you can cut down on the number of components in a computer and hence make a cheaper more efficient design. But putting what can be a whole circuit board on to a single chip can create problems as companies like Acorn and Enterprise have learnt to their cost. Much of the year's delay in the production of the Enterprise has been blamed on the difficulties of debugging the 'Nick' chip — the ULA which gives the Enterprise such advanced graphics specification. Acorn's Electron had similar problems with the big ULA which was supposed to replace a large slice of the BBC board.

"We could solve Acorn's problems at a stroke" boasts Oric's Barry Moncaster — an offer Acorn is unlikely to take up. Although Barry stresses the achievements of Oric in such a short time — 350,000 sold in the first two years "by then Sinclair hadn't got round to the ZX-81, Acorn hadn't got round to the Atom" Oric motivators Paul Johnson and Barry Moncaster have a long history in the micro business.



ic's Daisy is a £100,000 machine for designing ULAs.

Design of printed circuit boards is also automated — using a Racal unit. Far right: the new Quick Disc units — the first disc drives to break the £50 barrier.



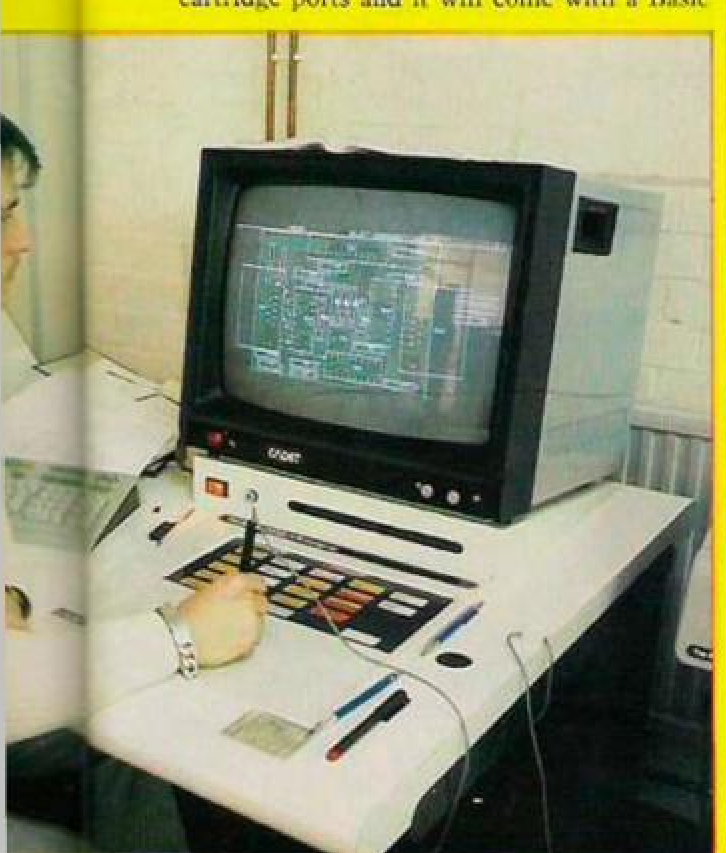
Barry claims to have produced the first commercial use of a microprocessor in Britain — a digital taxi meter which appeared on Tomorrow's World way back in 1974, and both were heavily involved in Tangerine, one of Britain's first micro makers set up during the fruity phase when people thought that if you were going to compete with Apple you had to sound like them.

Like Sinclair and other companies Tangerine was angry with the way Acorn was given the BBC contract. Paul and Barry now run Oric but the rancour survives especially with Acorn's Customer Services Department on the same industrial estate, literally overshadowing Oric's Cambridge base. "We share the same dustbin" says Barry "that's why we both have shredders."

Not impressed with Sinclair

Barry is not over impressed with Sinclair either "look at the Spectrum Plus. It comes out, you turn it over, tap the back and all the keys fall out. It was withdrawn a fortnight later. And he was knighted as a technological bloody genius — no wonder we are in a mess". Of course Oric had its own problems with returns in the early days which led to a crop of bad jokes on the lines of "Definition of an Oric 1 — prototype for Oric 2." But now Oric seems to have sorted out those problems along with the financial difficulties which have haunted it ever since it was launched on £1250 of capital. "If we go down" says Barry "it won't be because we've got an unreliable bad product."

The first new product which will go on sale in France from February is the Stratos — but in this country it's likely to be sold as an own brand under the name of a high street chain store. In effect it is a re-engineered Atmos with a reduced chip count, enhanced speed improved graphics and a built-in disc controller. This will allow you to plug in a cheap off the shelf drive costing as little as £120. Like the old Atari 800 the Stratos comes with no onboard language. Instead it has two cartridge ports and it will come with a Basic





Inside this innocent-looking black case Oric's new Stratos and MSX machines are lurking. Meirion Jones steals a glance at what else is in the Atmos makers' research and development cupboard.

cartridge and optional Logo.

The Stratos will have an Atmos command so you can run existing software. Some of the prototype Stratoses have a built-in Modem but this is unlikely to appear in the production version, because of the delays that submitting the whole machine for British Telecom approval might cause. Also Oric is uncertain how many potential owners would rather have the choice left to themselves — "you put up your costs to 100,000 when there's only demand from 10,000."

The same plastic box that houses the Stratos will be used for the MSX Oric. Again Oric expects this to do particularly well in France where the Government resorts to non-tariff barriers such as routing all video recorder imports through a small office in Poitiers against Japanese electronic consumer goods. In this country it is unlikely to appear under the Oric label.

Perhaps Oric's most interesting idea for next year is a cheap QL-basher. This would make sense — after all the Oric 1 was designed as a Spectrum basher. In kit form Oric could produce a 68008-based computer for less than £100 — but the question is whether computer buyers are still interested in kits or whether they have become used to buying a box off the shelf and just plugging it in?

Another plain clothes Oric which will appear next year under someone else's name is their IBM PC lookalike. This 8086-based machine will come with a suite of applications programs from a British software house. It will have a fraction of the number of chips an IBM has and will have "a full WIMP environment" — that does not mean you should be embarrassed to have one but that like a Macintosh it will have a window, icon, mouse program. The graphics chip designed for the PC lookalike is being sold to other companies separately.

Even further from the home market is the £3,000 portable Oric is developing, but around the laboratories are clues to products the company is planning to introduce to the home. One of them is the Radofen Quick Disc a new storage device introduced by the makers of the Aquarius computer.

This looks like a small disc drive and has 64K of memory on each side of a cheap disc. But the Quick Disc is not random access. Instead of the concentric tracks on a conventional disc the Quick Disc has a single spiral track — like a record — and the stylus moves sideways across the disc. This makes access times of the order of 7 seconds so perhaps Slow Disc would be a more accurate description but the Quick Disc with a price tag of £50 or less looks like a more reliable alternative to stringyfloppies and waferdrives.

Nothing to worry about

Many a company has collapsed despite having a research laboratory full of promise but if Oric can bring these products to market, the company should have nothing to worry about. Diversification into other fields such as medical electronics, selling custom chip designs to larger corporations, and the continuing strength of the Atmos in France gives Barry Moncaster confidence that Oric has a solid base from which to launch its new wave in the 1985 Spring offensive. ■



PLUS

PRESENT LEE MAJORS in FALL GUY

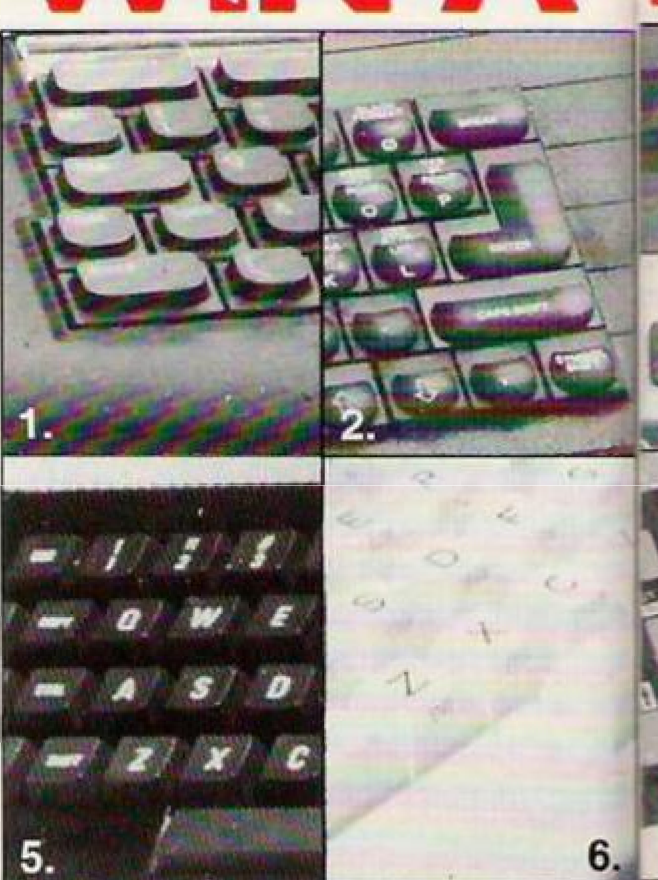
WIN A T

RULES

- The winners of the competition will be the people who correctly identify the computers and in the view of the Editor, come up with the most amusing suggestion for a computing film or TV series title.
- The name of the winners will be printed in the March issue of *Your Computer.*
- All entries must arrive at the *Your Computer* offices by the last working day in January 1985.
- Each person may enter, the competition only once.
- Entries to the competition cannot be acknowledged.
- No employee of Business Press International or their relatives may enter the competition.
- The decision of the Editor is final.
- No correspondence on the result of the competition will be entered into.
- Business Press International assumes no responsibility or liability for any complaints arising from this competition.

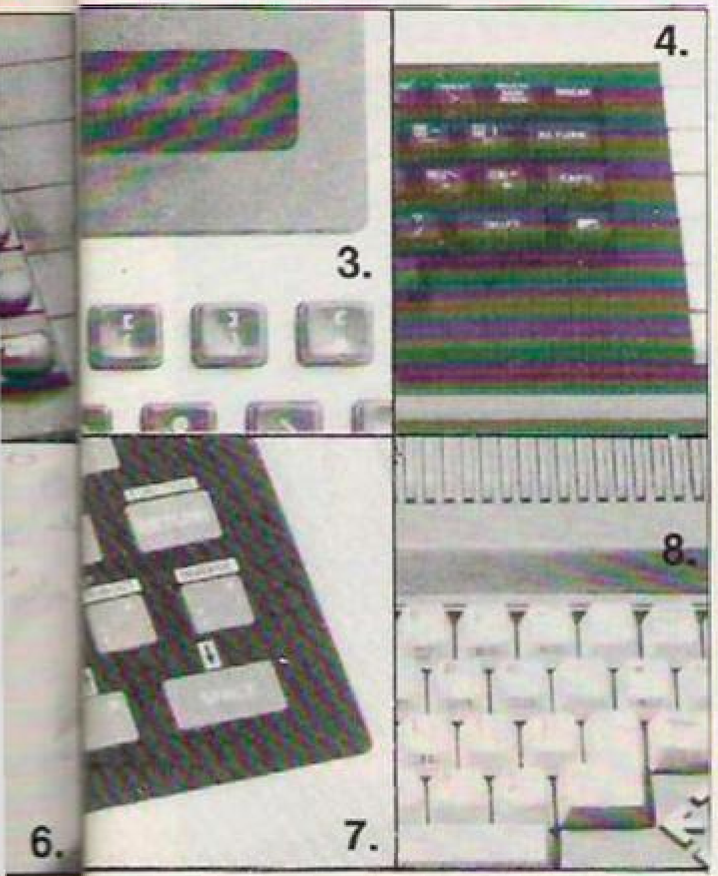
Your chance to win a fabulous trip to Hollywood. Two lucky winners of the *Your Computer* Elite competition will be flown in a British Caledonian jet to LA to visit Disneyland and the film set where Fall Guy is made.





FALL GUY *Competition*

TRIP TO HOLLYWOOD



YOUR COMPUTER COMPETITION

If you can identify the computers on the left, you could win a trip to Hollywood. Just put the number on the photo in the box next to the machine you think it belongs to. Now put yourself in the shoes of a big-time Hollywood producer about to launch a new block-buster TV series or film about computers. What would you call it?

- ☐ Acorn Atom
- ☐ Acorn Electron
- ☐ Atari 600XL
- ☐ Commodore Plus 4
- ☐ Enterprise
- ☐ NewBrain
- ☐ Spectrum +
- ☐ Texet TX-8000

What would be the title of your new blockbuster?

____

____

Name____________________

Address____________________

____

____

Age______



PRINTERS UNDER £200

If it grates to spend more on a printer than you did on your micro, there's no need to worry. Kathleen Peel prints out the answers.

Printer	Paper width	Speed cps	Normal print density	Printer noise level	Char quality wxh	No. off pins	Facilities	Min cost £
Battery operated printers								
Epson P40	4" t	45	5	3	5x9	9	c,e,g	100
Epson P80	8"	@15	4	5	9x9	9	?	160
Brother HR5	8"	30	6	4	9x9	9	c,e,g,s	145
Mains powered printers								
Brother M-1009	10"	50	5	6	9x9	9	c,e,g,s	
Smith Fastext 80	10"	80	8	7	9x8	8	c,e,g	175
Shinwa CPA 80	10"	100	9	8	7x8	9	c,e,g,p,s,u	199
Seikosha GP-500	10"	50	5	6	5x7	7	c,e,g	160

t = thermal paper
p = proportional spacing
ch = foreign character sets
e = enlarged print
g = graphics
i = italic
c = condensed print
s = skip perforation
u = user defined

THERE ARE three major factors in the choice of a printer for use at home by the hobbyist, they range from the type of use envisaged for the machine, the environment in which it will work and the physical aspects of connecting the printer to your computer.

The *Your Computer* review is limited to classes of machines that sell for under £200, which this year encompass machines that are capable of producing very reasonable quality print and graphics.

The principal uses of a printer are either producing listings of programs being developed or of printed text, either letter or manuscript. Other more exotic requirements range from modern art to hard copy of household budget details.

The printer parameters that are relevant to the type of use are:

(continued on page 75)

DANGER MOUSE

BRITAIN'S NUMBER ONE CARTOON CHARACTER ON COMPUTER GAMES FROM CREATIVE SPARKS

DANGER MOUSE IN DOUBLE TROUBLE

The evil Baron Silas Greenback has built an android Danger Mouse which must be destroyed and there is not a moment to lose. Guide Danger Mouse and Penfold through the deep jungle to the layer of the Baron and then halt the loading sequence before it's too late. Can you help Danger Mouse save the world? Fast loading cassette (C-64 version).

WIN
A Rolls Royce and helicopter trip to meet Cosgrove Hall the creators of Danger Mouse. Each pack contains full details.

DANGER MOUSE IN THE BLACK FOREST CHATEAU

This adventure program is no piece of cake! As Danger Mouse, the World's Greatest Secret Agent, you will need all your wits about you to track down the fiendish Pi-beam operator....and will develop a range of useful skills as you go.

- *for early adventurers of any age*
- *no typing skills required*
- *lots of superb graphics*

"The graphics...are stunning on the Spectrum and even better on the C64"
Computer and Video Games (Sept '84)

TWO GREAT NEW GAMES FOR THE C-64 AND SPECTRUM 48K

CREATIVE SPARKS

Available from All good computer software stockists.

Send me (tick as required)

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☐ **DM IN DOUBLE TROUBLE** TNCE223 (C64)	**£7.95**
☐ **DM IN THE BLACK FOREST CHATEAU** TNCC231 (SPECTRUM)	**£6.95**
☐ **DM IN THE BLACK FOREST CHATEAU** TNCE233 (C64)	**£7.95**
☐ My local stockist's address	
☐ Your full list of games	
Game/s at £6.95/£7.95 each	£ : p
+ single P&P sum	: 30p
Total to send	£ : p

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By cheque or PO (no cash) made payable to **TECS**
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Response within 21 days.

Creative Sparks,
Department MO,
296 Farnborough Road,
Farnborough, Hampshire, GU14 7NF.
Telephone: (0252) 518364.

Name
Address

YC0185

(continued from page 73)
Printer paper width: 4in., 8in. or computer paper.
Print type, matrix, thermal or biro.
Printer consumables cost.

Although the 4in. wide paper is perfectly adequate for listings and sending in magazine articles, it is not really practical for letters. The 8in. paper printers use A4 sheets and roll paper, which are not suitable for printing the manuscript of your latest novel, but are ideal for letters. The 9in. wide computer paper printers are capable of meeting most requirements.

The running costs vary with the type of use envisaged for the printer.

A case can be made for each type of printer for average types of usage and the choice will depend on many factors.

A printer subject to considerable use should under normal circumstances be a dot matrix which in eneral is capable of running faster than the other types of low cost printer.

One comment here on the point of speed, unless you have used a much faster printer, it is unlikely that you will be bothered much by a "slow" printer. What you do not know, you will not miss.

Print quality can vary significantly and the following points should be noted.

Generally, black thermal paper provides a much better print quality than the mauve paper that is sometimes available. Many manufacturers supply the 4 inch wide thermal paper now and they are not all of the same quality. If you can, sample different makes.

Several of the matrix printers are capable of providing draft copies of text and a better quality "Elite" print mode where each character is formed by writing the horizontal dots closer together. The printers differ considerably in the standard number of dots used across a character.

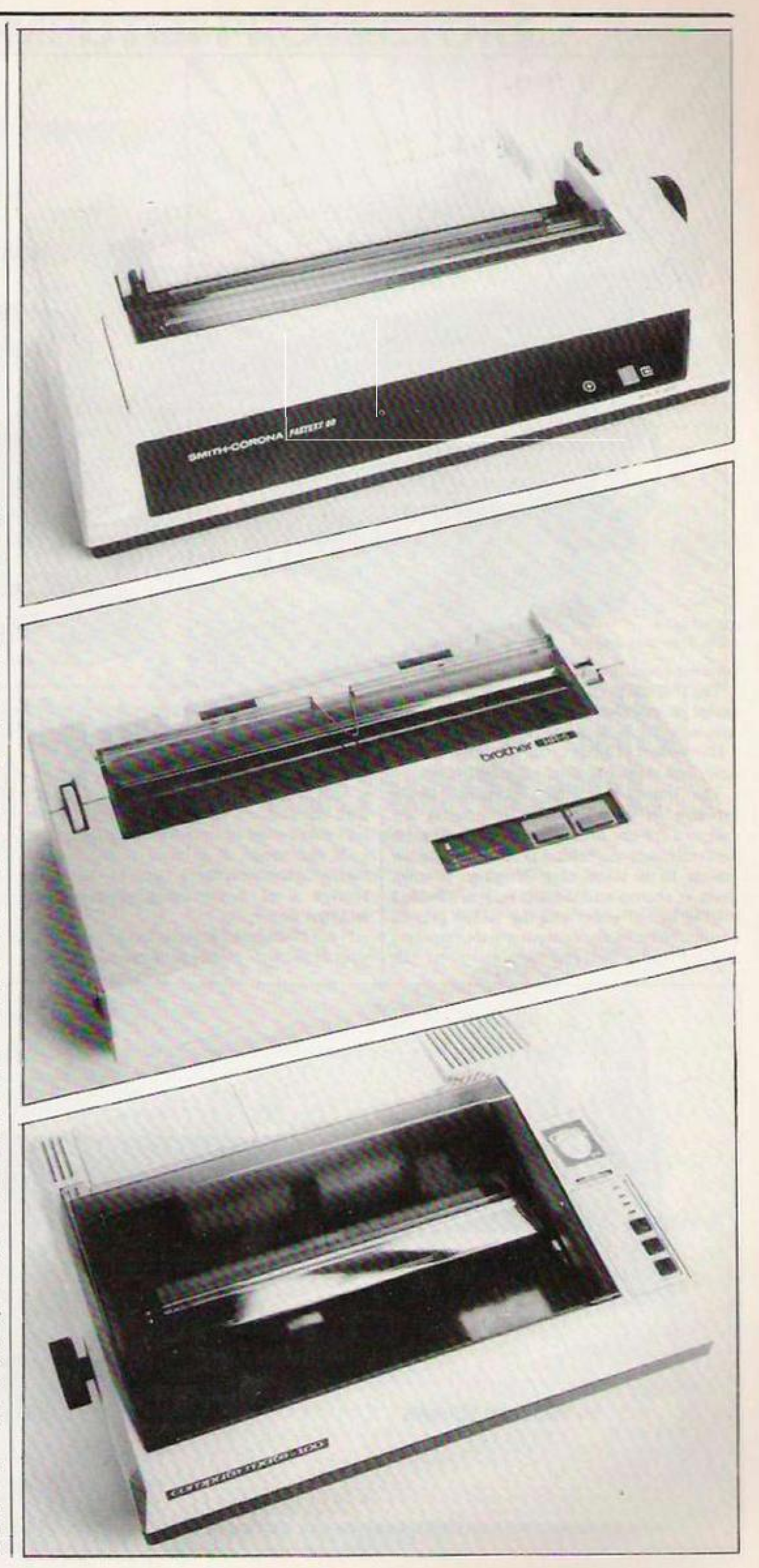
A further improvement in quality is perceived with proportional spacing of text, the I's and the M's etc take up different character space lengths giving a much cleaner look to the text, although you pay for it in terms of what proportional spacing does to right justified text.

A very important aspect of print quality is the number of pins in the matrix head. There should be nine for true lowercase descenders, otherwise with seven pins the g, y, q and the p sit on lines and look very odd. Printers that use eight pins have a half way position which is perfectly acceptable where the character sits one position above the line with the descender dangling one position below the line.

Where the thermal printer uses a ribbon, the thermal ribbons are normally single pass and have a very limited life. Printer portability without a portable computer is illogical and can become an expensive means of printing if the batteries are not rechargeable, we would suggest that the optional mains supply power unit is a very worthwhile investment if you consider buying a non-rechargeable portable. Getting caught short without a battery is no fun.

Generally, the faster the machine, the noisier it is likely to be. In the home environment, a dot matrix printer of speed greater than 30 cps is likely to annoy people in an

(continued on next page)





(continued from previous page)

adjacent room if running continuously.

The thermal printers are quiet and some are usable in the same room as other occupants without disturbance.

Daisywheel printers break the rules, they're noisy and slow, but produce quality print.

The home computing enthusiast has a problem in that virtually all printers are designed for the office environment where a desk with a space behind is allocated for the printer. In the home, everything goes on small desks or shelves and there is no space behind for the box of paper and the folded printed output. None of the computer paper printers allowed tractor feed and front entry and exit for the paper as they invariably snagged the paper perforations.

The Smith-Corona Fastext 80 was used with friction feed and front access for a considerable period of time without problems.

Of the range of printers tested, all the battery portables were smaller than the average sized home computer taking up minimal desk space.

None of the small printers has any problems with additional space requirements as they are not capable of handling the fanfold sprocketted computer paper.

Generally, printers are fitted with a Centronics interface as the standard, an RS-232 version being available either as an alternative or as an optional extra. Buying a printer with a standard interface makes sense as it can probably be used on any computer that you might buy in the future. Several computers have their own special printer interface and use of these special printers with other computers is unlikely.

The printers are all in the range of about £100 to £200 and provide a wide selection of facilities. The additional cost of running the printer should be seriously considered when evaluating which machine to buy as unlike a computer, as you use the printer, it costs money.

May not be typical

Note that figures are our assessment and based on a survey of one, which may or may not be typical, but they are as supplied.

The Epson P40 is a true thermal printer using thermal paper, the 8in. wide paper printers are thermal transfer printers that use ordinary paper and a thermal ribbon.

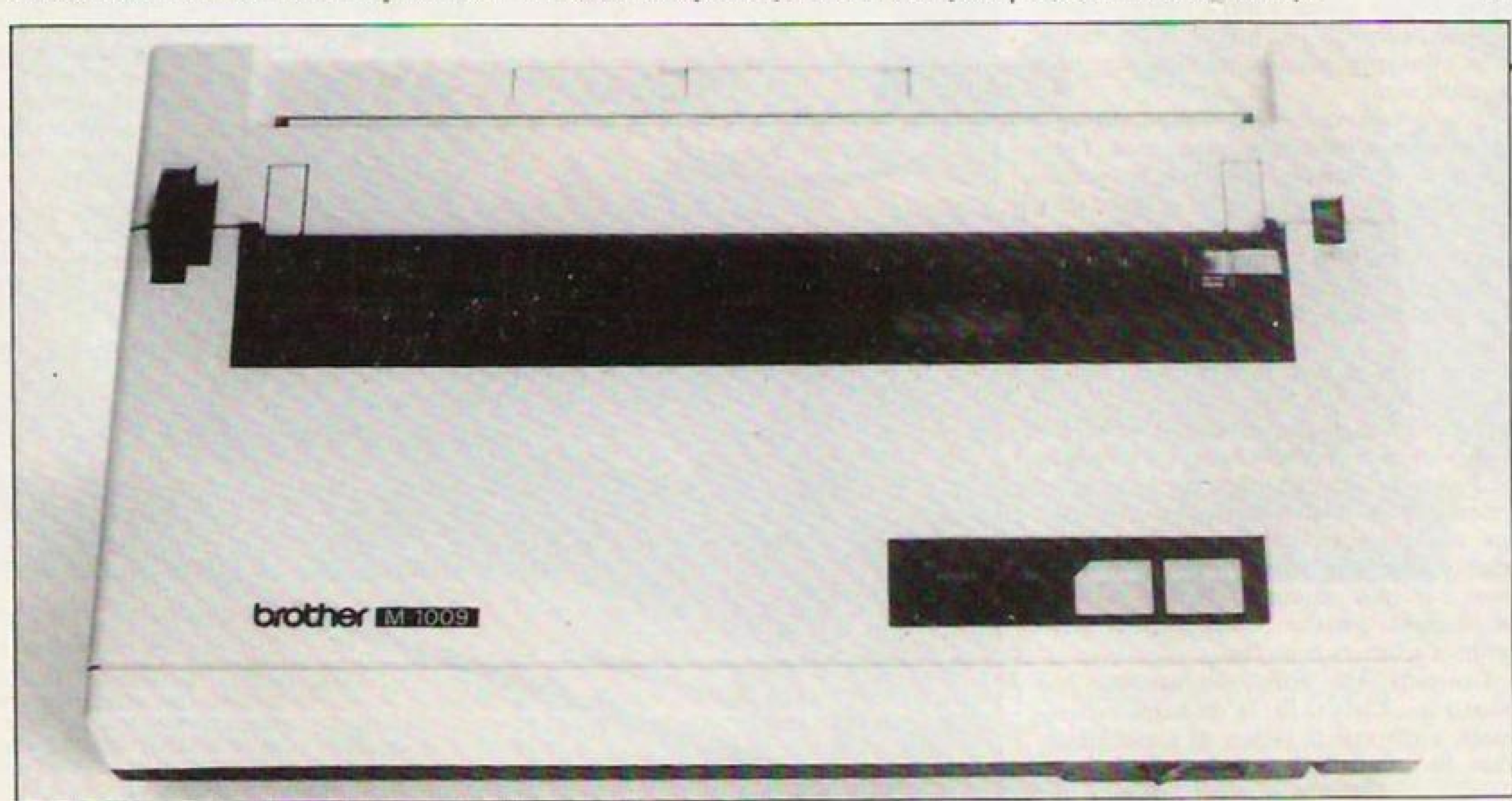
The speed is given for normal draft quality text. Printing "elite" chracters sometimes results in reduced speed of operation.

Print density is for normal print, the printers are capable of double strike/emphasised print modes for darker printing. Higher values are best.

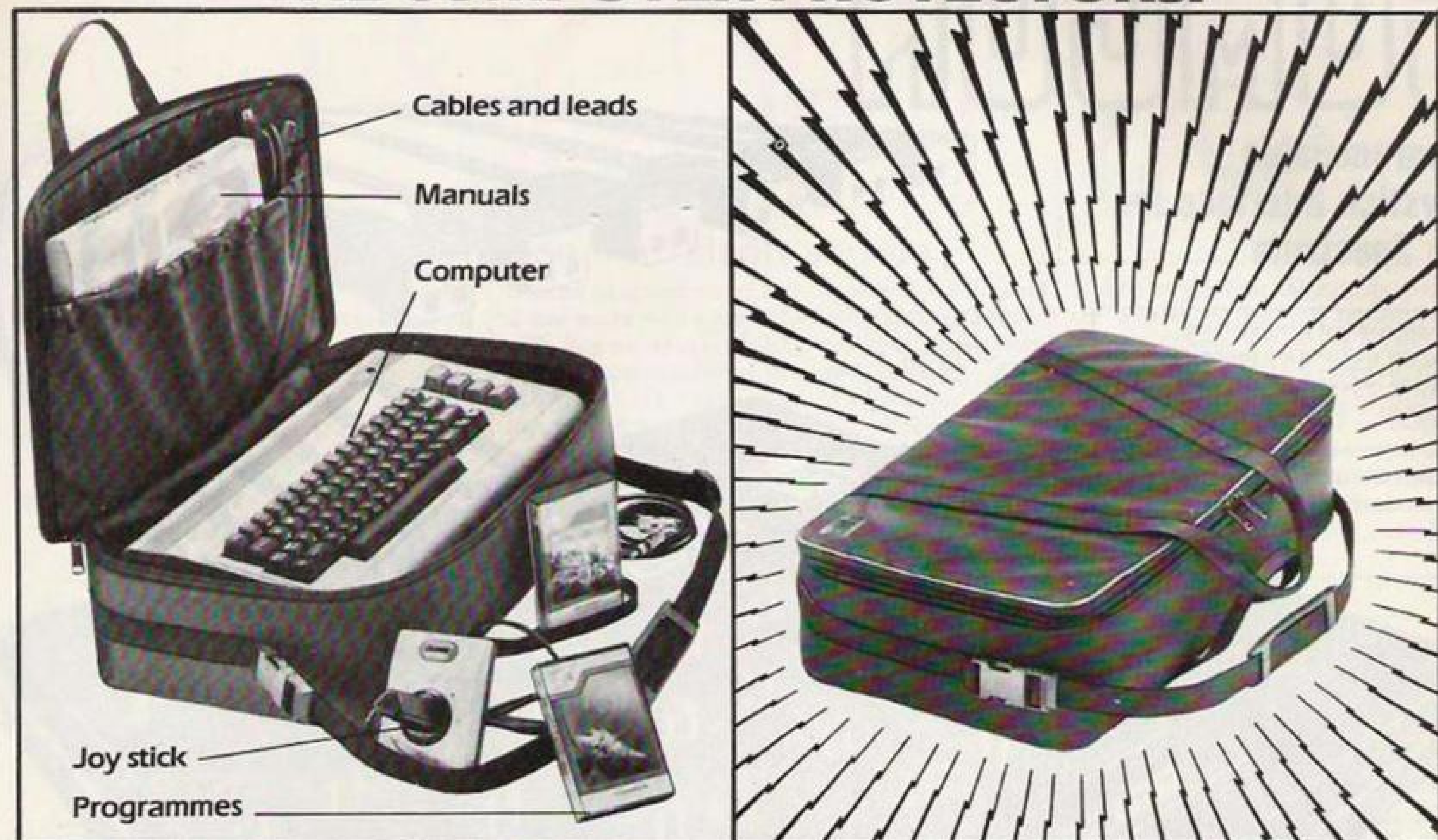
Printer noise is for the printer running at standard speed. Lower values are best.

All the printers are capable of double density graphic printing, the Brother M-1009 has a quadruple density graphic mode with 1920 dots per 8in. line.

Asked to make a choice we would probably choose the Brother HR5 portable with mains unit or any of the mains powered dot matrix printers except the Seikosha. They each represent value for money. ■



THE COMPUTER PROTECTORS.



Keep everything you want in.

And everything you don't, out.

Static and dust, the biggest enemies of the home computer. Fortunately there are now Targus computer bags.

Thanks to the protectastat, specially treated material, these unique bags give your computer total anti-static and dust protection. Only Targus can do this.

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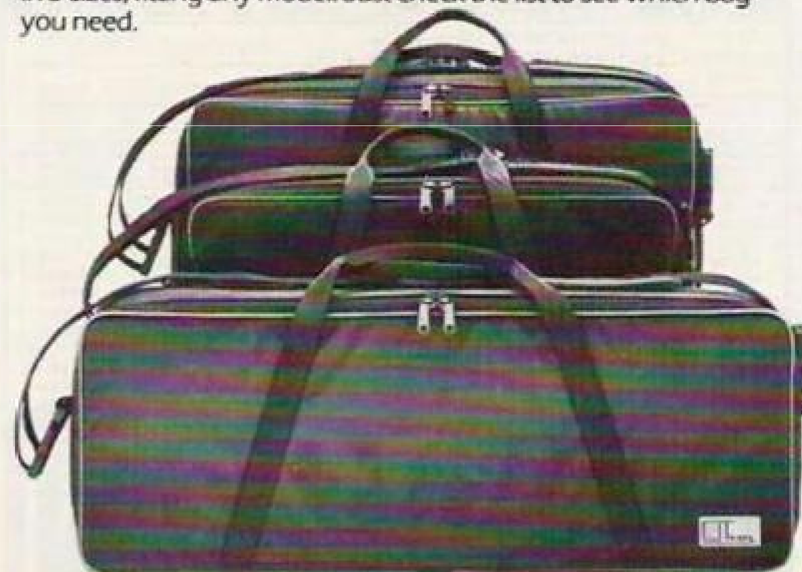
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TELSOFT

A reminder of how to use the Telsoft service.

THE PROGRAMS given here will enable Spectrum and BBC owners to download via *Your Computer's* Telsoft service. First type the hexloader for your machine — figure 1 — and then enter the machine code — figure 2. On the BBC you call the service by entering

CALL &6A00

while Spectrum owners must type

RANDOMIZE USR 60000

So far OE Ltd's Telemod 2 and VTX 5000 modems have been tested with the service, but it also works with a number of other makes.

To find out what is available on Telsoft and how to receive software dial up Colchester (0206) 8068. This audio recorded information line will also advise you which telephone numbers to ring for the 300 and 1200 bit/s services.

When a program you want to download is available, make sure your modem is set up and dial the number appropriate to your modem's speed. As soon as you hear the modem tones switch the modem to line and replace the receiver. Select Option 1 from the menu — Receive. After a block of data is received, you will see "OK" printed if there were no errors, otherwise the program will wait for the blocks to come round again.

When the "Program loaded OK" message appears return to the Telsoft menu and select Option 5. You can now save and run the program.

Figure 1. BBC.

```
10 REM BBC HEX CODE LOADER
15 HIMEM=&69FF
20 CLS:PRINT
30 INPUT " START ADDRESS (Hex)";A$
40 A=EVAL("&"+A$)
50 IF A>&6F87 THEN 200
60 IF A<&6A00 OR A>&6FE7 THEN 20
70 PRINT ~A" ";
80 INPUT ":" B$,C$
90 IF LEN(B$) <>16 THEN 50
100 T=0
110 FOR N=0 TO 7
120 X$= MID$(B$,2*N+1,1): GOSUB 300
130 IF E=1 THEN 260
140 X$= MID$(B$,2*N+2,1): GOSUB 300
150 IF E=1 THEN 260
160 B= EVAL("&"+MID$(B$,2*N+1,2))
170 ?A=B:A=A+1:T=T+B
180 NEXT
190 FOR M = 1 TO LEN (C$)
200 X$=MID$(C$,M,1):GOSUB 300
210 IF E =1 THEN A=A-1: GOTO 260
220 NEXT
230 IF T= EVAL("&"+C$) THEN 50
240 PRINT "CHECKSUM ERROR !"
250 A=A-8:GOTO 50
260 PRINT "TYPING ERROR !"
270 A=8*(A DIV 8):GOTO 50
280 *SAVE "DOWNLOAD" 6A00 6F87
290 END
300 E=0:IF ASC(X$)<48 THEN E=1:RETURN
310 IF ASC(X$)<58 THEN RETURN
320 IF ASC(X$)<65 THEN E=1:RETURN
330 IF ASC(X$)>71 THEN E=1
340 RETURN
```

Figure 2. BBC.

```
6A00 :A9C0A0FEA20120F4,4C6
6A08 :FF20616C20486DC9,3BA
6A10 :31F00BC934F0E9C9,4CB
6A18 :35F0064C0CA64C47,200
6A20 :6AA90C20E3FFA9C8,482
6A28 :A000A2FF20F4FFA9,4FD
6A30 :03A20020F4FFA902,363
6A38 :A20220F4FFA9C8A0,4C8
6A40 :FEA20020F4FF60A9,48C
6A48 :0C20E3FF20F760A9,439
6A50 :15A20120F4FFA000,3EB
6A58 :A9FF0099056FD0FA,587
6A60 :A915A20120F4FF20,394
6A68 :0C6C90F0290C6C80,348
6A70 :FBA0000477847004,416
6A78 :79847A047B057020,388
6A80 :056DA57029F0C900,489
6A88 :00E2200C6C080099,46B
6A90 :7100C020056DC009,364
6A98 :D0F0A000A5742900,422
6AA0 :D00BA51C857A10A5,354
6AA8 :1065738577200C6C,289
6AB0 :B00520E3FFC02005,524
6AB8 :6DC010D0F0A57320,435
6AC0 :B26D200C6C800AC5,3CC
6AC8 :7AF000A95820E3FF,478
6AD0 :20E7FF4C676A200C,34F
6AD8 :6C800CC570F000A9,40C
6AE0 :5020E3FF20E7FF4C,4AC
6AE8 :676AA573A009056F,43E
6AF0 :D00E20E7FFA90820,380
6AF8 :E3FF4CB36B4C676A,46D
6B00 :A000047AB47B200C,2C9
6B08 :6C80F2917620D56D,477
6B10 :CBC475D0F1200C6C,45A
6B18 :00E3C57AF00BA950,4CE
6B20 :20E3FF20E7FF4CA7,4B0
6B28 :6A200C6C80CFC57B,3C1
6B30 :F000A95820E3FF4C,447
6B38 :676A20C76B20E7FF,429
6B40 :A573A0A90099056F,3F6
6B48 :A58AC902D0582007,419
6B50 :6BA9C820556CA955,3BB
6B58 :20306EA95020556C,290
6B60 :A915A20120F4FF20,394
6B68 :F76BA471C0808905,505
6B70 :6FD05198D0F7A90C,4A4
6B78 :20E3FF20A56DA95A,437
6B80 :0582A96F0583A907,3D7
6B88 :20006E20F86D20A0,2D0
6B90 :6DA90520006EA900,2DA
6B98 :20E3FF20F86DA9D2,502
6BA0 :20E0FF4C0C6AA955,3BF
6BA8 :20306EA99620556C,2DE
6BB0 :4C6A6BA475200C6C,2D2
6BB8 :80D0FA200C6C200C,316
6BC0 :6C4C486B4C6C6AA9,336
6BC8 :2020E3FFA96F20E3,43D
6BD0 :FFA96B20E3FF60A9,51E
6BD8 :9CA000A68AE002D0,41E
6BE0 :08A21320F4FFA212,387
6BE8 :20F4FF60A29720F4,4C0
6BF0 :FFA29620F4FF60A9,553
6BF8 :9CA000A68AE002D0,41E
6C00 :EBA25320F4FFA252,4E7
6C08 :20F4FF6010A99605,44F
6C10 :0F047EA991A20020,38D
6C18 :F4FFB009C007D005,448
6C20 :68604C0C6AA47E20,2D4
6C28 :496CC60FD0023860,374
6C30 :A58AC902D0062079,369
6C38 :6ED0EC60A991A201,447
6C40 :20F4FF90A47E80DF,55C
6C48 :600AA2D2CAE8CAD0,5AA
6C50 :FDAA60A900047EA8,450
6C58 :20496C08D0FAA47E,449
6C60 :60A9EBA000A2FF20,452
6C68 :F4FFA900850AA90C,460
6C70 :20E3FF20A86DA904,3E4
6C78 :20006EA9090502A9,2F0
6C80 :6F0503A00020F86D,39C
6C88 :20156DC941F00BC9,370
6C90 :42F011C943F0174C,3A2
6C98 :616CA90BA20120F4,335
6CA0 :FF4CB76CA90BA203,3C4
6CA8 :20F4FF4CB76CA900,433
6CB0 :A20420F4FFE60AA5,4CE
6CB8 :7C20E3FFA47C20A0,46D
6CC0 :6DA90020006E20FB,2C4
6CC8 :6DA01720156DC941,2D0
6CD0 :F00BC942F011C943,413
6CD8 :F0174C616CA907A2,372
6CE0 :0120F4FF4C096DA9,37F
6CE8 :07A20320F4FF4C09,314
6CF0 :6DA907A20420F4FF,3D6
6CF8 :E60AA50AC902D009,443
6D00 :A9E0A000A20120F4,3E0
6D08 :FFA57C20E3FF2053,495
6D10 :6C20536C6020A86D,2E3
6D18 :A90520006E20F86D,2C1
6D20 :20A86DA90520006E,274
6D28 :20F86D20A86DA905,36D
6D30 :20006E20F86D20A0,2DE
6D38 :6D047EA90320006E,2A9
6D40 :A9D220E0FF857C60,4DB
6D48 :A90C20E3FF20A86D,3EF
6D50 :A90720006EA99A85,306
6D58 :02A96E0503A00020,361
6D60 :F86D20A86D20996D,3C8
6D68 :20996D20996D20A8,317
6D70 :6DA90A20006E20FB,2C6
6D78 :6D20A86DA9022000,270
6D80 :6E20F86D20A86D20,348
6D88 :E7FFA9D220E0FF40,5A0
6D90 :A90FA20020F4FF60,3D5
6D98 :60A90020006E20FB,287
6DA0 :6D20A86D6020A86D,33A
6DA8 :20A86D20E7FF20E7,445
6DB0 :FF604029F06A6A6A,3FE
6DB8 :6A0930C93A300318,1F1
6DC0 :690720E3FF60290F,312
6DC8 :0930C93A30031869,1F0
6DD0 :0720E3FF60457B05,3AE
6DD8 :7BA200A57B2A900C,30B
6DE0 :A57B4900857BA57A,390
6DE8 :4910857A267A267B,299
6DF0 :CAD0EB6020E3FFC8,5AC
6DF8 :B102C900D0F6C860,4F7
6E00 :867DAAA92020E3FF,478
6E08 :CAD0FAA67D60C97F,55F
6E10 :D008A90620F4FFE0,4FD
6E18 :00F012A97FC92000,3C3
6E20 :0EC90AF00AC90DF0,3A1
6E28 :06C907F002A90060,2D1
6E30 :057CB67D047EA991,[illegible]40
6E38 :A20120F4FFA903A2,404
6E40 :0720F4FFA996A200,403
6E48 :20F4FF902902F0F4,40A
6E50 :A47CA997A20920F4,41F
6E58 :FFA903A20420F4FF,464
6E60 :A991A20020F4FFB0,49F
6E68 :09C007D00560604C,2C1
6E70 :0C6AA57CA67DA47E,3DC
6E78 :60047E867DA996A2,446
6E80 :0020F4FF902901F0,3CD
6E88 :0BA996A20920F4FF,408
6E90 :9018900130A67DA4,340
6E98 :7E60444F574E4C4F,281
6EA0 :4144494E47204D45,215
6EA8 :4E550D3120202052,193
6EB0 :4543454956450D34,1F2
6EB8 :2020205345542042,1AE
6EC0 :6175642052617465,2E6
6EC8 :0D35202020455849,188
6ED0 :5420544F20424153,200
6ED8 :49430D454E544552,217
6EE0 :204E554D42455200,1F6
6EE8 :2020555345204354,1EC
6EF0 :524C2D4720544F20,1F5
6EF8 :52455455524E2054,254
6F00 :4F204D454E552029,1ED
6F08 :0D53455420545241,200
6F10 :4E534D4954204261,24E
6F18 :756420526174650D,292
6F20 :4120202037352042,16F
6F28 :6175640D42202033,1FC
6F30 :303020426175640D,209
6F38 :4320313230302042,188
6F40 :6175640D53455420,253
6F48 :5245434549564520,223
6F50 :4261756420526174,2C3
6F58 :650D50524F475241,23D
6F60 :4D20204C4F414445,1F2
6F68 :4420204F4B0D5052,28D
6F70 :45535320414E5920,213
6F78 :4B455920464F5220,210
6F80 :4D454E550D202020,1A2
```

Figure 1. Spectrum.

```
5 REM SPECTRUM 48k           fig 1
10 REM Hex Code Loader
15 CLEAR 59000
20 POKE 23658,8: CLS : PRINT
30 INPUT "Start Address ";a
50 IF a>61135 THEN GO TO 280
60 IF a<60000 THEN GO TO 20
70 PRINT a;
80 INPUT " :";b$
85 IF b$="END" THEN GO TO 280
90 IF LEN b$<>20 THEN GO TO 260
100 LET t=a-256*INT (a/256)
110 FOR n=0 TO 7
120 LET x$=b$(2*n+1 TO 2*n+1)
125 GO SUB 300: LET y=x
130 IF e=1 THEN GO TO 260
140 LET x$=b$(2*n+2 TO 2*n+2)
145 GO SUB 300: LET y=y*16+x
150 IF e=1 THEN GO TO 260
170 POKE a,y: LET a=a+1
180 LET t=t+y: NEXT n: LET y=0
190 FOR m=1 TO 3
200 LET x$=b$(17+m TO 17+m)
205 GO SUB 300: LET y=y*16+x
210 IF e=1 THEN LET a=a-1: GO TO 260
220 NEXT m
230 IF t=y THEN PRINT ":";b$: GO TO 50
240 PRINT "Checksum Error"
250 LET a=a-8: GO TO 50
260 PRINT "Typing Error"
270 LET a=8*INT (a/8): GO TO 50
280 SAVE "download"CODE 60000,1136
290 POKE 23658,0: STOP
300 LET e=0: LET x=CODE x$-48-7*(x$>"9")
310 IF x<0 OR x>15 THEN LET e=1
320 RETURN
```

Figure 2. Spectrum.

```
60000 :CD15EDC307ECCD15,4C7
60008 :EDCD36ECCD66EDCD,631
60016 :50EDCD47EE38FBCD,5AF
60024 :0BEDFE31CA99EAFE,69A
60032 :35CA07EAC366EACD,5D0
60040 :15ED3EFACD04EDCD,5FD
60048 :15EDC9CD15EDC366,553
60056 :EACD66ED11E5EE06,58C
60064 :003EFF121310FCCD,458
60072 :15EE11CDEE06173E,3D2
60080 :20121310FCCD1FED,3DA
60088 :30F0CD50EDCD1FED,5B8
60096 :38FB3265EF3E0032,3E9
60104 :6CEF326FEF3270EF,544
60112 :3A65EFCDEBEC3A65,5A1
60120 :EFEAF0FE0020DE0E,627
60128 :091165EFCD1FEDDA,501
60136 :AAEA1312CDEBEC0D,552
60144 :20F23A69EFE60020,51A
60152 :00214B5C3A66EF0E,36C
60160 :004709226BEF0E00,1DA
60168 :11CDEECD1FED309A,47F
60176 :12130CCDEBEC79FE,45C
60184 :1020F03A60EFCDB1,447
60192 :ECCD1FEDDAAAEA21,374
60200 :6FEFBE20133E5011,326
60208 :E0EE12133E0012CD,340
60216 :D7ECCDA6EDC3AAEA,681
60224 :CD1FEDDAAAEA2170,510
60232 :EFBE20E121E5EE3A,524
60240 :6BEF856F3E000C67,3CC
60248 :3E00BE2000CDD7EC,40F
60256 :3E21320B5CC3FFEB,4B2
60264 :3E00326FEF3270EF,3C7
60272 :ED5B6BEF0E00CD1F,40C
60280 :EDDAAAEA3273EFCD,634
60288 :EBEC3A6BEFFE0020,506
60296 :053A69EFE6003A73,432
60304 :EF12130C3A66EF09,3FC
60312 :200CCD1FEDDAAAEA,5DB
60320 :216FEFBEC22DEBCD,584
60328 :1FEDDAAAEA2170EF,5A2
60336 :BEC22DEB3EAF32E2,509
60344 :EE3E6B32E3EE3E00,490
60352 :32E4EE3A085CFE21,501
60360 :2003CD15EECDD7EC,553
60368 :CDA6EC21E5EE3A68,5C5
60376 :EF856F3E000C6736,422
60384 :0021E5EEED4B6AEF,561
60392 :0C7EFE00C2B0EA23,4FC
60400 :0D20F63EFACD04ED,509
60408 :3E01D3FEC366EACD,5E0
60416 :1FED30FBC30DEAF3,594
60424 :0603AFD3FF10FB3E,3DB
60432 :40D3FF3EFFD3FF3E,56F
60440 :31D3FF3E0F320F5C,385
60448 :328D5C32405C3E01,250
60456 :D3FE21915CCB9EFB,568
60464 :CD50EDC366EACD15,52F
60472 :EECD66ED3E01D3FE,556
60480 :2165EE3E00CD0FEC,442
60488 :CD84ECCDA3ECCDA6,654
60496 :EC23CD77ECCD77EC,50F
60504 :CDA0ECCD84ECCDA6,661
60512 :EC233E0DCD0FECCD,4CF
60520 :04EC23CDA3EC3E03,490
60528 :CD0FECCD84ECC9CD,688
60536 :A3EC3E07CD0FECCD,561
60544 :04EC23C97EFE00C8,520
60552 :CD0BED23C304ECFE,651
60560 :00CDF53E20CD0BED,520
60568 :F13DC30FECCDA0EC,65D
60576 :CDA3ECCDA6EC3E0D,5A6
60584 :CD0BED3EFF320C5C,574
60592 :C9F513E6F0CB1FCB,60C
60600 :1FCB1FCB1FF630FE,4CF
60608 :3AFACAECCA071213,498
60616 :F1E60FF630FE3AFA,686
60624 :D4ECC6071213C921,46C
60632 :CDEEE5CD04ECE106,69C
60640 :173E20772310FC3E,339
60648 :0077C9F52170EFAE,538
60656 :77C30E007EA7CB17,449
60664 :30007EEE00773A6F,3C9
60672 :EFEE10326FEF3721,3D5
60680 :6FEFCB1623CB160D,350
60688 :20E2C1E1C9110501,394
60696 :216A00CDB503C93E,32F
60704 :963277EFCD47EDDA,529
60712 :2EEDF1C366EACDAC,5C0
60720 :ED7BE601F602D3FE,548
60728 :AF2177EF35200237,2FC
60736 :C9CD77ED30EBC9CD,5F0
60744 :47EED0FECB0C37C9,5E6
60752 :F5DBFF3A01EFFE00,5C7
60760 :20043E3610023E37,187
60768 :D3FFDB7FF1C9F53A,675
60776 :01EFFE0020043E36,376
60784 :D3FFCD50EDF1C93E,644
60792 :00DBFFE60037C0DB,59.
60800 :FFE60237C0DBFFE6,626
60808 :302004DB7FA7C93A,3E0
60816 :01EFFE0020043E37,397
60824 :10023E36D3FFDB7F,452
60832 :C9CD47ED3A73EFD0,5DE
60840 :F1C366EAF53ED23D,5EE
60848 :20FDF1C9CDACED3D,62A
60856 :20FAC9C5D5E5F5FE,700
60864 :7F2813CDF9EDFE0C,537
60872 :200CFE0D20053E20,20A
60880 :D73C0DD710103E20,34F
60888 :D73E00D73A085CFE,4E0
60896 :2120033E00D73E5F,2E6
60904 :D73E00D7F1E1D1C1,648
60912 :C9FE07281CFECB20,4F3
60920 :19FE0C2014FE0820,388
60928 :10FE0D200CFE20FA,367
60936 :0FEEFE00FA11EE3E,4BA
60944 :00C93E07C9CD6B0D,32C
60952 :3E02CD01163E1032,1C4
60960 :095CC93E121601CD,382
60968 :1122C93E121600CD,257
60976 :1122C9C5D5E53E02,3EB
60984 :CD0116CD47EE38FB,451
60992 :CD5CEEE1D1C1C93A,5CD
61000 :385CCB6F200C3A00,20F
61008 :5CF5213B5CCBAEF1,4C3
61016 :A7C937C9F5111000,3DE
61024 :CD10EDF1C9444F57,4D6
61032 :4E4C4F4144494E47,284
61040 :204D454E550D3120,216
61048 :2020524543454956,276
61056 :450D352020204578,217
61064 :697420746F204261,328
61072 :7369630D20205573,[illegible]
61080 :652053796D626F6C,[illegible]
61088 :2053686966742025,[illegible]
61096 :204720746F205265,[illegible]
61104 :7475726E20746F20,[illegible]
61112 :4D454E55[illegible]
61120 :4C544552204E55[illegible]
61128 :4245522000000000,[illegible]
```

CATERPILLAR

JR Wilson with an arcade-type game for the BBC.

CATERPILLAR IS A GAMES program for the BBC Micro model B or model A with 32k Ram. The program makes extensive use of machine code and the BBC's graphics to make a high speed arcade type game.

You control Fred, from the local pest control department, and are faced with a terrible task. Armed only with your trusty spray gun, you must face a garden full of mutated mushrooms and bugs.

There are 15 different options available from an option page, which can be accessed at any time by pressing the Escape key.

The program includes a pause facility to stop the game at any stage for more pressing interruptions. The initial control keys are as follows:

Z	=	Left
X	=	Right
:	=	Up
/	=	Down
Return	=	Fire spray gun
P	=	Pause on
S	=	Pause off

One final note. Fred earns another charge for his antidote when your score reaches 5,000 points.

The first program to be typed out is the large assembly language program, and is shown in listing four. It will take a lot of time and effort



to get through this program without making mistakes, so take your time. Before you attempt this, I suggest that you reset page to &1B00 by typing

PAGE = &1B00 then Return

then type New and Return.

You will then have to reset page to &1B000 after pressing the Escape key. The program as listed will assemble machine code from &D00 upwards, so for disc users, the Break key must be pressed and page reset before the program can be saved. Once you have finished typing it in, save the program on a separate cassette for a backup copy. Then run the program, but press the Escape key when asked whether to save the machine code.

It is now time to type out listing 1.

Once this program is working correctly it should be saved onto a separate cassette, at the beginning by

SAVE "CENTI"

The second program shown in listing 2 can now be typed out, and can be saved after 'Centi' by

SAVE "Centi1"

Once the program has been typed out, it should be saved after "Centil" by

SAVE "Centi2"

The third program will only work if the machine code is also in memory. Therefore, it is now time to save the machine code following this program on tape. So, load in the assembler program again and run it. Allow the program to record the machine code by pressing the Break key when told.

The game was written on a BBC fitted with the 1.2 Operating System, but should work on any non-0.1 O.S. The programs are also suitable for use with disc or tape systems without modifications.

This article is available on the Telsoft.

Listing 1.

```
10REM
20REM  Centipede
30REM
40REM  By  J.R.Wilson
50REM
60MODE7
70VDU23;8202;0;0;0;
80C%=&7C00
90FORY%=0TO40
100READ A$
110FORX%=0TO19
120?C%=EVAL("&"+MID$(A$,X%*2+1,2))
130C%=C%+1
140NEXT
150NEXT
160VDU28,17,16,26,13
170CLS
180PAGE=&5000
190CHAIN"Centi1"
200DATA [illegible]
210DATA [illegible]
220DATA [illegible]
230DATA [illegible]
240DATA [illegible]
250DATA [illegible]
260DATA [illegible]
270DATA [illegible]
280DATA [illegible]
290DATA [illegible]
300DATA [illegible]
310DATA [illegible]
320DATA [illegible]
330DATA [illegible]
340DATA [illegible]
350DATA [illegible]
360DATA [illegible]
370DATA [illegible]
380DATA [illegible]
390DATA [illegible]
400DATA [illegible]
410DATA [illegible]
420DATA [illegible]
430DATA [illegible]
440DATA [illegible]
450DATA [illegible]
460DATA [illegible]
470DATA [illegible]
480DATA [illegible]
490DATA [illegible]
500DATA [illegible]
510DATA [illegible]
520DATA [illegible]
530DATA [illegible]
540DATA [illegible]
550DATA [illegible]
560DATA [illegible]
570DATA [illegible]
580DATA [illegible]
590DATA [illegible]
600DATA [illegible]
610DATA [illegible]
620DATA [illegible]
630DATA [illegible]
640DATA [illegible]
650DATA [illegible]
660DATA [illegible]
670DATA [illegible]
680DATA [illegible]
```

Listing 2.

```
10REM
20REM  Centipede part 2
30REM
40REM  By J.R.Wilson
50REM
60*L.Centi2 1900
70*L.Centi3 3000
80*TAPE
90MODE7
100PROCL(5,5,CHR$132+CHR$157+CHR$134+"C E N T I P E
   D E  "+CHR$156)
110PROCL(7,10,"By  J.R.Wilson")
120FORI%=0 TO &DFB STEP 4
130I%!&D00=I%!&3000
140NEXT
150FORI%=&DFC TO &DFF
160I%?&D00=I%?&3000
170NEXT
180PROCset_up
190PROCL(3,14,"Do you want instructions ?")
200REPEAT A$=GET$
210UNTIL A$="Y" OR A$="N" OR A$="y" OR A$="n"
220IF A$="Y" OR A$="y" THEN PROCinstructions
230ON ERROR PROCerror
240REPEAT
250CLS
260PROCL(5,0,"Current control keys:")
270PROCF(5,"Pause on  = ",P%)
280PROCF(7,"Pause off = ",S%)
290PROCF(9,"Left      = ",L%)
300PROCF(11,"Right     = ",R%)
310PROCF(13,"Up        = ",U%)
320PROCF(15,"Down      = ",D%)
330PROCF(17,"Fire      = ",F%)
340PROCL(5,20,"Define your own ?")
350REPEAT A$=GET$
360UNTIL A$="Y" OR A$="N" OR A$="y" OR A$="n"
370IF A$="Y" OR A$="y" THEN PROCkeys:UNTIL FALSE
380UNTIL TRUE
390CLS
400*FX15,1
410RESTORE
420FORI%=0 TO 18
430READ A$
440X%=130:Y%=0:Y%=ASC(A$)
450IF A$="!" THEN Y%=13
460CALL&FFF4
470NEXT
480END
490DATA F,A,S,E,+,&,1,0,0,0,!,O,L,D,!,R,U,N,!
500DEF PROCL(X%,Y%,A$)
510PRINTTAB(X%,Y%)CHR$141;A$
520PRINTTAB(X%,Y%+1);CHR$141;A$;
530ENDPROC
540DEF PROCset_up
550*FX4,1
560L%=-98:R%=-67:U%=-73:D%=-105:F%=-74:P%=-56:S%=-82
570ENVELOPE1,2,-1,-1,-1,20,20,20,120,0,0,0,120,120
580ENVELOPE2,1,-1,20,0,20,1,1,120,0,0,0,120,120
590ENVELOPE3,1,0,0,0,0,0,0,120,-1,-2,-3,127,127
600ENVELOPE4,1,-1,-1,-1,50,50,60,120,0,-2,-5,120,120
610REM User characters
620REM Man
630VDU23,250,24,60,60,60,24,24,126,189
640VDU23,251,189,189,189,36,36,36,36,102
650ENDPROC
660DATA f0,33,f1,114,f2,115,f3,116,f4,21
670DATA f5,117,f6,118,f7,23,f8,119,f9,120
680DATA A,65,B,101,C,82,D,51,E,35,F,68
690DATA G,84,H,85,I,38,J,70,K,71,L,87,M,102
700DATA N,86,O,55,P,56,Q,17,R,52,S,82,T,36
710DATA U,54,V,100,W,34,X,67,Y,69,Z,98,1,49
720DATA 2,50,3,18,4,19,5,20,6,53,7,37,8,22
730DATA 9,39,0,40,-,24,^,25,\,121,@,72,[,57
740DATA _,41,;,88,:,73,],89,",",103,.,104
750DATA /,105,TAB,97,CAPS LOCK,65,CTRL,2
760DATA SHIFT LOCK,81,SHIFT,1,SPACE BAR,99
770DATA DELETE,90,COPY,106,RETURN,74
780DATA CURSOR UP,58,CURSOR DOWN,42,CURSOR LEFT,26,C
   URSOR RIGHT,122
790DEF FNread
800RESTORE 660
810I=0
820REPEAT
830I=I+1
840IF I=72 THEN I=1:RESTORE 660
850READ A$,A%
860UNTIL INKEY(-A%)
870=-A%
880DEF PROCkeys
890CLS
900PROCL(2,0,"Press your required key for:")
910PROCL(5,3,"Left  =")
920L%=FNread
930PROCL(13,3,A$)
940PROCL(5,6,"Right =")
950REPEAT
960R%=FNread
970UNTIL L%<>R%
980PROCL(13,6,A$)
990PROCL(5,9,"Up    =")
1000REPEAT
1010U%=FNread
1020UNTIL U%<>L% AND U%<>R%
1030PROCL(13,9,A$)
1040PROCL(5,12,"Down  =")
1050REPEAT
1060D%=FNread
1070UNTIL D%<>L% AND D%<>R% AND D%<>U%
1080PROCL(13,12,A$)
1090PROCL(5,15,"Fire  =")
1100REPEAT
1110F%=FNread
1120UNTIL F%<>L% AND F%<>R% AND F%<>U% AND F%<>D%
1130PROCL(13,15,A$)
1140REPEAT
1150PROCL(2,18,"Pause on =")
1160P%=FNread
1170UNTIL P%<>L% AND P%<>R% AND P%<>F% AND P%<>D% AND
P%<>U%
1180PROCL(13,18,A$)
1190PROCL(1,21,"Pause off =")
1200REPEAT
1210S%=FNread
1220UNTIL S%<>P% AND S%<>L% AND S%<>R% AND S%<>F% AND
S%<>U% AND S%<>D%
1230PROCL(13,21,A$)
1240PROCspace
1250CLS
1260ENDPROC
1270DEF PROCerror
1280IF ERR=17 THEN ENDPROC
1290REPORT:PRINT" in line ";ERL
1300*FX4,0
1310END
1320DEFPROCspace
1330PRINTTAB(0,24);"Press the SPACE BAR to continue...
";
1340REPEAT UNTIL GET=32
1350ENDPROC
1360DEF PROCF(X%,A$,T%)
```

(continued on next page)

(continued from previous page)

```
1370RESTORE 440
1380REPEAT
1390READ D%,A%
1400UNTIL A%=-T%
1410PROCL(10,X%,A%+D%)
1420ENDPROC
1430DEF PROCinstructions
1440CLS
1450PRINT'"   You control Fred, from the local pest"
1460PRINT"control, and are faced with a terrible"
1470PRINT'"task. Armed only with your trusty spray"
1480PRINT'"gun, you must face a garden full of"
1490PRINT'"mutated mushrooms and bugs. Keep Fred"
1500PRINT'"alive as long as possible by spraying "
1510PRINT'"all the giant pests that occupy the"
1520PRINT'"garden. Defend yourself against the"
1530PRINT'"marauding centipede covered in poisonous"
1540PRINT"hairs by shooting all the segments"
1550PRINT'"before you are touched."
1560PROCspace
1570CLS
1580PRINT'"Dodge giant spiders or blast them with"
1590PRINT'"your gun for bonus points. Collect even"
1600PRINT'"more bonus points by killing the snail"
1610PRINT'"and spraying the ants.Dodge the mushroom"
1620PRINT"laying bug if you want, or give it a"
1630PRINT'"quick blast with your spray gun. Points"
1640PRINT'"are awarded as follows:"
1650PRINT' SPC5"Centipede segment    = 25  Points"
1660PRINTSPC5"Mushroom dropper      = 50  Points"
1670PRINTSPC5"Spider                = 300 Points"
1680PRINTSPC5"Ant                   = 250 Points"
1690PRINTSPC5"Snail                 = 500 Points"
1700PROCspace
1710CLS
1720PRINT"   Just when you thought you had the"
1730PRINT'"game licked, the ants and spiders start"
1740PRINT'"spitting acid at you, which is as lethal"
1750PRINT"as your own gun. Fred has one last line"
1760PRINT'"of defence. He is carrying a special"
1770PRINT'"antidote that can counteract any poison"
1780PRINT'"that the nasties are using, but he only"
1790PRINT'"has enough for two applications. So Fred"
1800PRINT"will be killed if he is hit three times."
1810PRINT"The game includes many variations and"
1820PRINT'"skill levels to change the game from"
1830PRINT'"hard to virtually impossible."
1840PROCspace
1850CLS
1860PRINT"    There are 15 different options"
1870PRINT'"available from an option page, which can"
1880PRINT"be accessed at any time by pressing the"
1890PRINT'"ESCAPE key. They are as follows:"
1900PRINT'CHR$130"A"CHR$129"Start game:"CHR$135"Start
s the game, setting"
1910PRINT'"up all the options as previously chosen."
1920PRINTCHR$130"B"CHR$129"Save high score table:"CHR
$135"This option"
1930PRINT'"allows you to save the high score table"
1940PRINT'"onto tape."
1950PRINT'CHR$130"C"CHR$129"Load high score table:";C
HR$135"This can load"
1960PRINT'"a pre-recorded high score table from"
1970PRINT'"tape into memory."
1980PROCspace
1990CLS
2000PRINT'
2010PRINT'CHR$130"D"CHR$129"Overall game speed:";CHR$
135"This selects the"
2020PRINT'"initial overall speed of the game, and"
2030PRINT'"can be in the range 1 to 8."
2040PRINT'CHR$130"E"CHR$129"Number of mushrooms:";CHR
$135"This selects the"
2050PRINT"initial relative number of mushrooms,"
2060PRINT'"and can also be in the range 1 to 8."
2070PRINT'CHR$130"F"CHR$129"Speed of snail:"CHR$135"Y
ou can change the"
2080PRINT'"speed of the snail with this option in"
2090PRINT'"the range 1 to 8 where 1 is fast.This is"
2100PRINT"usually left at 3 or 4 for most players."
2110PROCspace
2120CLS
2130PRINTCHR$130"G"CHR$129"Speed of ant:"CHR$135"This
 option selects the"
2140PRINT"speed of the ant in the range 1 to 8."
2150PRINT'"It is usually set to 2 or 3."
2160PRINT'CHR$130"H"CHR$129"Speed of spider:";CHR$135
"This changes the"
2170PRINT'"speed of the spider in the range 1 to 8."
2180PRINT"It is usually set to 1 or 2 for most"
2190PRINT'"players"
2200PRINT'CHR$130"I"CHR$129"Height of spider:";CHR$13
5"This changes the"
2210PRINT'"initial maximum height which the spider"
2220PRINT'"reaches and can be in the range 1 to 8,"
2230PRINT'"where 8 is the highest. It is usually"
2240PRINT'"set to 8 unless you are good at dodging."
2250PROCspace
2260CLS
2270PRINT'CHR$130"J"CHR$129"Acid spitting spider:"CHR
$135"This option can"
2280PRINT"enable or disable the acid spitting"
2290PRINT'"spider. Some players may wish to disable"
2300PRINT"this option to avoid the low, spitting"
2310PRINT'"spiders."
2320PRINT'CHR$130"K"CHR$129"Acid spitting ant:";CHR$1
35"Similarly, this"
2330PRINT'"option controls the acid spitting ant."
2340PRINT'CHR$130"L"CHR$129"Mushroom dropper:";CHR$13
5"This option can"
2350PRINT'"enable or disable the mushroom dropper"
2360PRINT'"to avoid any extra obstacles appearing"
2370PRINT'"during the game."
2380PROCspace
2390CLS
2400PRINT'''CHR$130"M"CHR$129"Mushroom dropper speed:
";CHR$135"This changes"
2410PRINT'"the speed of the mushroom dropper in the"
2420PRINT"range 1 to 8."
2430PRINT'CHR$130"N"CHR$129"Sound:";CHR$135"This opti
on can turn on or off"
2440PRINT"all the sound within the game, for quiet"
2450PRINT"play if necessary."
2460PRINT'CHR$130"O"CHR$129"Joystick:";CHR$135"This o
ption selects between"
2470PRINT"joystick and keyboard controls. The"
2480PRINT'"keyboard controls can be freely selected"
2490PRINT"at the beginning of the game if required"
2500PROCspace
2510CLS
2520PRINT"    The program also includes a pause"
2530PRINT'"facility to stop the game at any stage"
2540PRINT'"for more pressing interuptions."
2550PRINT'"The initial control keys are as follows:"
2560PRINT'SPC10CHR$129"Z"CHR$135"= Left"
2570PRINTSPC10CHR$130"X"CHR$135"= Right"
2580PRINTSPC10CHR$131":"CHR$135"= Up"
2590PRINTSPC10CHR$132"/"CHR$135"= Down"
2600PRINTSPC5CHR$133"RETURN"CHR$135"= Fire spray gun"
2610PRINTSPC10CHR$134"P"CHR$135"= Pause on"
2620PRINTSPC10" S = Pause off"
2630PRINT''"    One final note. Fred earns another"
2640PRINT'"charge for his antidote when your score"
2650PRINT'"reaches 5,000 points."
2660PROCspace
2670ENDPROC
```

Listing 3.

```
   10a=&1821:b=&1853:c=&1114:d=&144C:e=&132F:f=&1A87:g
=&1130:h=&130F:i=&141A:j=&144F:l=&190C:m=&199C:n=&1433
:o=&1A7C
   20MODE7:PROCL(5,5,CHR$132+CHR$157+CHR$134+"C E N T
I P E D E  "+CHR$156)
   30PROCL(9,12,CHR$129+"By"+CHR$130+"J.R.Wilson")
   40Toad=&EF8:CLD=&F80:CHD=&F8C:Mdata=&CA0
   50CX=&700:CY=CX+15:XM=CY+15:YM=XM+1
   60CT=YM+1:MX=CT+15:MY=MX+1:SP=MY+1
   70CD=SP+1:LK=CD+1:RK=LK+1:UK=RK+1
   80DK=UK+1:FK=DK+1:PK=FK+1:SK=PK+1
   90SL=SK+1:ST=SL+1:SX=ST+1:SY=SX+1
  100SPX=SY+1:SPY=SPX+1:SPD=SPY+1:WN=SPD+1
  110SH=WN+1:SOU=SH+1:JOY=SOU+1
  120SC=JOY+1:DF=SC+3:AX=DF+1:AY=AX+1
  130AD=AY+1
  140CD=AD+1:SNP=CD+15:SPP=SNP+1:ASP=SPP+1
  150SPH=ASP+1:SDY=SPH+1
  160SX=SDY+1:GY=SX+2
  170SSPD=GY+2:ASPD=SSPD+1:DX=ASPD+1
  180DY=DX+1:DO=DY+1:DS=DO+1
  190BO=DS+1
  200IS=5:SO=1:IH=28:IMM=5
  210?LK=L%:?RK=R%:?UK=U%:?DK=D%:?FK=F%:?PK=P%:?SK=S%
  220?JOY=0
  230?ASP=3:?SPP=3:?SNP=7
  240?DO=1:?ASPD=1:?SSPD=1:?DS=3
  250PROCL(1,17,"Do you want to change an option ?")
  260REPEATA$=GET$:UNTILA$="Y"ORA$="N":IFA$="Y"GOTO1320
  270MODE2:ONERRORGOTO1310
  280VDU23;8202;0;0;0;
  290FORI%=0TO15
  300VDU19,I%,I%AND7,0,0,0
  310NEXT
  320COLOUR130
  330PRINTSPC(80);
  340COLOUR3
  350PRINTTAB(1,1)"SCORE"
  360PRINTTAB(7,1)"WAVE"
  370COLOUR6
  380FORI%=0TO2
  390PRINTTAB(I%*2+17,1);
  400VDU238,10,8,231
  410NEXT
  420?SP=15+15:?MY=0:?SPH=IH
  430?SC=0:SC?1=0:SC?2=0:?ST=0:?SPD=0:?WN=0
  440CALLS
  450?SH=3:?SOU=SO:?AD=0
  460?DY=0:GY?1=0
  470?DY=0
  480?MO=0:NM=INM+15
  490COLOUR130
  500?YM=20:?XM=30
  510?&70=?XM:?&71=?YM:?&72=Mdata:?&73=Mdata/256:?&74=
40:CALLa
  520?&71=?YM+1:?&72=Mdata+40:?&73=(Mdata+40)/256:CALL
a
  530COLOUR130
  540FORI%=0TO14:I%?CT=0:NEXT
  550FORI=0 TO NM
  560IFI%MOD3=0THENPROCa
  570?&70=RND(18)+4:?&71=RND(23)+6
  580?&72=Toad:?&73=Toad/256:?&74=32
  590CALLa:NEXT
  600A=RND(2):IFA=2A=-1
  610PRINTTAB(8,2);RIGHT$("0"+STR$(?WN),2)
  620FORI%=0TO14:I%?CT=0:NEXT
  630FORI%=0TO14
  640IFI%MOD2=0THENPROCa
  650T=I%MOD3 +1
  660CD?I%=A:CT?I%=T:?&72=CL0?T:?&73=CH0?T:?&74=32
  670?&70=I%*4+10:?&71=5:CX?I%=?&70:CY?I%=5
  680CALLa:NEXT:?SL=15
  690?DF=0:CALLf
  700IF ?DF=1 THEN 810
  710FORI%=0TO100
  720PROCa:IF?DF=1THENI%=100
  730FORI=1TO50:NEXT:NEXT
  740IF?DF=1THEN810
  750?WN=?WN+1
  760IF(?WNMOD3=0AND?SPH)28THEN?SPH=?SPH+1
  770IF ?SP>5THEN?SP=?SP-1
  780VDU19,1,(?WNMOD6 +1,0,0,0
  790IF(?WNMOD3=0THENVDU28,0,31,19,4:COLOUR128:CLS:VD
U26:NM=NM+5:?MY=0:GOTO510
  800GOTO600
  810SOUND&12,0,0,0:SOUND&13,0,0,0:SOUND&10,17+(?SOU),
3,255
  820FORI%=255 TO 0 STEP -1
  830SOUND&11,0,I%,1
  840VDU19,0,RND(7),0,0,0
  850NEXT
  860VDU28,0,31,19,4:COLOUR128:CLS
  870?ST=0:?DY=0:?SY=0:GY?1=0:?SPD=0
  880?MY=0:?AD=0
  890VDU19,0,0,0,0,0,26:SOUND&10,0,0,0
  900COLOUR130
  910?SH=?SH-1
  920PRINTTAB(12+(?SH)*2,1);" ";TAB(12+(?SH)*2,2);" "
  930IF?SH<>0THEN500
  940FORI=0TO5000:NEXT
  950SC=VAL(RIGHT$("0"+STR$~(SC?2),2)+RIGHT$("0"+STR$~
(SC?1),2)+RIGHT$("0"+STR$~(?SC),2))
  960FL=-1
  970FORI=9TO0 STEP-1
  980IF SC>VAL($(&D00+I*6))THEN FL=I
  990NEXT
 1000IF FL=-1THEN1150
 1010IFFL=9THEN1060
 1020FORI%=9TO FL STEP-1
 1030$(&D06+I%*6)=$(&D00+I%*6)
 1040$(&D60+I%*16)=$(&D50+I%*16)
 1050NEXT
 1060COLOUR128:COLOUR5:PRINTTAB(3,10)"You are ranked"
 1070PRINTTAB(5,12)"number : ";FL+1
 1080COLOUR3:PRINTTAB(3,14)"Enter your name"
 1090COLOUR4:PRINTTAB(3,16)"................"
 1100COLOUR7:PRINTTAB(3,16);:*FX15,1
 1110X%=0:Y%=9:A%=0
 1120?&900=&50+FL*16:?&901=&D:?&902=15
 1130?&903=32:?&904=128:CALL&FFF1
 1140$(&D00+FL*6)=RIGHT$("0000"+STR$SC,5)
 1150VDU22,7:PROCL(5,1,CHR$130+"Centipede "+CHR$129+"H
all of fame")
 1160FORI%=0TO9:PRINT'SPC5;$(&D00+I%*6);"  -  ";$(&D50
+I%*16)
 1170NEXT:PRINT'"Press the SPACE BAR to play again..";
 1180*FX15,1
 1190REPEATUNTILINKEY0=32OR(ADVAL(0)AND1)=1:GOTO270
 1200DEFPROCa
 1210CALLd:CALLg:Y%=0:CALLi:Y%=1:CALLi
 1220IF?ST<>0CALLh
 1230IF?AD<>0CALLl
 1240IF?SPD<>0CALLj
 1250IF?MY<>0CALLm ELSECALLn
 1260IF?DY<>0CALLo
 1270ENDPROC
 1280DEFPROCL(X%,Y%,A$)
 1290PRINTTAB(X%,Y%)CHR$141A$;TAB(X%,Y%+1)CHR$141A$
 1300ENDPROC
 1310IFERR<>17ORINKEY-1REPORT:PRINT" in line ";ERL:END
 1320VDU22,7
 1330PROCL(10,1,CHR$131+"Option page")
 1340PRINTTAB(10,3)CHR$148;STRING$(13,CHR$163)
 1350PRINT''"  A  -  Start game"
 1360PRINT"  B  -  Save high score table"
 1370PRINT"  C  -  Load high score table"
 1380PRINT"  D  -  Overall speed"
 1390PRINT"  E  -  Number of mushrooms"
 1400PRINT"  F  -  Speed of snail"
 1410PRINT"  G  -  Speed of ant"
 1420PRINT"  H  -  Speed of spider"
 1430PRINT"  I  -  Height of spider"
 1440PRINT"  J  -  Acid spitting spider"
 1450PRINT"  K  -  Acid spitting ant"
 1460PRINT"  L  -  Mushroom dropper"
 1470PRINT"  M  -  Mushroom dropper speed"
 1480PRINT"  N  -  Sound"
 1490PRINT"  O  -  Joystick controls"
 1500PRINTTAB(0,22)"Press the required letter : ";
 1510REPEAT A$=GET$:UNTILA$>="A"ANDA$<="O"
 1520PRINTTAB(1,ASC(A$)-59);CHR$136;A$;CHR$137
 1530PRINTTAB(0,22)SPC40
 1540IFA$="A"GOTO270
 1550IFA$="B"CLS:*SAVE CDM*HIDC D00+FF
 1560IFA$="C"CLS:*LOAD CDM*HIDC
 1570IFA$="D"IS=FNA
 1580IFA$="E"INM=FNA
 1590IFA$="F"?SNP=(2^FNA)-1
 1600IFA$="G"?ASP=(2^FNA)-1
 1610IFA$="H"?SPP=(2^FNA)-1
 1620IFA$="I"IH=28-2*FNA
 1630IFA$="J"?SSPD=FNB
 1640IFA$="K"?ASPD=FNB
 1650IFA$="L"?DO=FNB
 1660IFA$="M"?DS=(2^FNA)-1
 1670IFA$="N"SO=FNB
 1680IFA$="O"?JOY=FNB
 1690GOTO1320
 1700DEFFNA:PRINTTAB(0,22)"Enter number in range 1 to
8 : ";
 1710REPEATA$=GET$:UNTILVALA$>0ANDA$<>"9":=VALA$-1
 1720DEFFNB:PRINTTAB(5,22)"Enter Enable or Disable ; " :
 1730REPEATB$=GET$:UNTILB$="E"ORB$="D":=INSTR("DE",B$) -1
```

Listing 4.

```
 10REM
 20REM  Centipede
 30REM
 40REM  By J.R.Wilson
 50REM
 60*T.
 70ENVELOPE1,2,-1,-1,-1,20,20,20,120,0,0,0,120,120
 80ENVELOPE2,1,-1,20,0,20,1,1,120,0,0,0,120,120
 90ENVELOPE3,1,0,0,0,0,0,0,0,120,-1,-2,-3,127,127
100ENVELOPE4,1,-1,-1,-1,50,50,60,120,0,-2,-5,120,120
110MODE7
120PRINT''"Have you saved this program ?"
130PRINT''"Press the SPACE BAR if you have.."
140REPEAT UNTIL GET=32
150CLS
160Z%=&E00
170CLB=Z%
180MSB=CLB+32
190Cdata=MSB+32
200Mdata=Cdata+96
210Toad=Mdata+80
220Bdata=Toad+32
230bullet=Bdata+64
240spider=bullet+8
250ant=spider+64
260CLB=ant+32
270CHB=CLB+4
280SLB=CHB+4:SHB=SLB+3:BOI=SHB+3
290Soundfire=BOI+3
300Soundendfire=Soundfire+8:Soundspider=Soundendfire+8
310Soundendspider=Soundspider+8:Soundbang=Soundendspider+8
320Soundbonus=Soundbang+8
330Soundspit=Soundbonus+8
340Sdrop=Soundspit+8
350SL=drop+32
360CX=&700:CY=CX+15:XM=CY+15:YM=XM+1
370CT=YM+1:MX=CT+15:MY=MX+1:SP=MY+1
380CD=SP+1:LK=CD+1:RK=LK+1:UK=RK+1
390DK=UK+1:FK=DK+1:PK=FK+1:SK=PK+1
400SL=SK+1:ST=SL+1:SX=ST+1:SY=SX+1
410SPX=SY+1:SPY=SPX+1:SPD=SPY+1:WN=SPD+1
420SH=WN+1:SOU=SH+1:JOY=SOU+1
430SC=JOY+1:DF=SC+3:AX=DF+1:AY=AX+1
440AD=AY+1
450CD=AD+1:SNP=CD+15:SPP=SNP+1:ASP=SPP+1
460SPH=ASP+1:SDY=SPH+1
470SX=SDY+1:GY=SX+2
480SSPD=GY+2:ASPD=SSPD+1:DX=ASPD+1
490DY=DX+1:DO=DY+1:DS=DO+1
500BO=DS+1
510REM Graphics data
520REM Centipede 1
530DATA 0,64,192,192,192,192,5,0
540DATA 192,192,192,192,192,192,64,10
550DATA 192,192,192,192,192,192,128,5
560DATA 0,128,192,192,192,192,10,0
570REM Centipede 2
580DATA 0,64,192,192,192,192,5,5
590DATA 192,192,192,192,192,192,64,0
600DATA 192,192,192,192,192,192,128,0
610DATA 0,128,192,192,192,192,10,10
620REM Centipede 3
630DATA 0,64,192,192,192,192,5,10
640DATA 192,192,192,192,192,192,64,0
650DATA 192,192,192,192,192,192,128,0
660DATA 0,128,192,192,192,192,10,5
670FORI%=0TO95
680READ A%
690B%=A%:IFA%=64THENB%=1
700IFA%=128THENB%=2
710IFA%=192THENB%=3
720I%?Cdata=B%
730NEXT
740REM Man 1
750DATA 0,0,0,0,0,0,0,0
760DATA 0,0,0,0,0,0,17,51
770DATA 15,15,15,15,15,15,15,15
780DATA 0,0,0,34,51,20,0,0
790DATA 0,0,0,0,0,40,60,20
800REM Man 2
810DATA 20,60,40,60,80,20,0,0
820DATA 40,0,0,17,56,56,60,0
830DATA 0,0,51,51,40,40,40,60
840DATA 0,0,0,34,52,52,60,0
850DATA 20,20,20,60,60,40,0,0
860FORI%=0TO79
870READ A%
880I%?Mdata=A%
890NEXT
900REM Toadstool
910DATA 0,1,3,3,0,0,0,0
920DATA 1,3,43,3,20,20,20,20
930DATA 3,23,3,3,40,40,40,40
940DATA 0,3,3,43,0,0,0,0
950FORI%=0TO31
960READ A%
970IF A%<>0 THEN A%=A% OR 192
980I%?Toad=A%
990NEXT
1000REM Snail 1
1010DATA 0,0,1,3,3,3,35,51
1020DATA 0,3,3,3,3,3,3,51
1030DATA 0,0,2,3,3,19,51,34
1040DATA 5,10,51,51,34,34,0,0
1050FORI%=0TO31
1060READA%
1070I%?Bdata=A%
1080NEXT
1090REM Bullet
1100DATA 7,11,7,11,7,11,7,11
1110FORI%=0TO7
1120READA%
1130I%?bullet=A%
1140NEXT
1150REM Snail 1
1160DATA 10,5,51,51,17,17,0,0
1170DATA 0,0,0,1,3,35,51,17
1180DATA 0,1,3,3,3,3,3,51
1190DATA 0,0,2,3,3,3,19,51
1200FORI%=32TO43
1210READA%
```

(continued on page 84)





the BAD

The fun of the fair and the fury of Kong! Now you can know what it feels like to be a dodgem, only this time you're running up and down the Roller Coaster dodging the cars, giant buns and jumping springs. But the fun has only just begun!...wait until the fury starts! The wacky Waltzer and the zany Swinging Gym are enough to unhinge the sanest fun fair fanatic. **Kong Strikes Back** is all good fun but it's bound to bring out the bad in you!

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(continued from page 82)

```
1220I%?Sdata=A%
1230NEXT
1240REM Spider
1250DATA 0,0,0,1,2,0,1,2
1260DATA 0,0,0,2,1,2,1,1
1270DATA 0,21,35,31,39,31,0,1
1280DATA 17,39,49,31,31,27,19,0
1290DATA 34,35,30,31,31,39,35,0
1300DATA 0,42,39,31,27,31,0,2
1310DATA 0,0,0,1,2,1,2,2
1320DATA 0,0,0,2,1,0,2,1
1330FORI%=0TO63
1340READ A%
1350I%?spider=A%
1360NEXT
1370REM Ant
1380DATA 0,0,17,34,0,0,17,34
1390DATA 30,30,35,1,1,35,16,16
1400DATA 40,40,19,2,2,19,32,32
1410DATA 0,0,34,17,0,0,34,17
1420FORI%=0TO31
1430READA%
1440I%?ant=A%
1450NEXT
1460REM User characters
1470REM Man
1480VDU23,230,24,60,60,60,24,24,126,189
1490VDU23,231,189,189,189,36,36,36,36,102
1500FORI%=0 TO 31
1510LSB?I%=&3000+I%*640
1520MSB?I%=(&3000+I%*640)/256
1530NEXT
1540FORI%=0 TO 7
1550READ A%
1560I%?Soundfire=A%
1570NEXT
1580DATA &11,0,1,0,150,0,1,0
1590FORI%=0 TO 7
1600READ A%
1610I%?Soundendfire=A%
1620NEXT
1630DATA &11,0,0,0,0,0,0,0
1640FORI%=0TO7
1650READ A%
1660I%?Soundspider=A%
1670NEXT
1680DATA &12,0,2,0,150,0,1,0
1690FORI%=0 TO 7
1700READ A%
1710I%?Soundendspider=A%
1720NEXT
1730DATA &12,0,0,0,0,0,0,0
1740FORI%=0TO7
1750READ A%
1760I%?Soundbang=A%
1770NEXT
1780DATA &10,0,3,0,6,0,6,0
1790FORI%=0 TO 7
1800READ A%
1810I%?Soundbonus=A%
1820NEXT
1830DATA &13,0,3,0,120,0,6,0
1840FORI%=0TO7
1850READ A%
1860I%?Soundspit=A%
1870NEXT
1880DATA &13,0,4,0,200,0,30,0
1890FORI%=1TO3
1900A%=I%-1
1910I%?CLB=A%*32+Cdata
1920I%?CHB=(A%*32+Cdata)/256
1930NEXT
1940FORI%=1TO2
1950A%=I%-1
1960B%=1:IFI%=2B%=-1
1970I%?SLB=A%*32+Sdata
1980I%?SHB=(A%*32+Sdata)/256
1990I%?SDI=B%
2000NEXT
2010REM Dropping data
2020FORI%=0TO31
2030READ A%
2040I%?drop=A%
2050NEXT
2060DATA 51,51,51,23,23,1,0,0
2070DATA 34,51,51,49,59,19,3,1
2080DATA 17,51,51,50,55,35,3,2
2090DATA 51,51,51,43,43,7,0,0
2100FOR I%=0 TO 3 STEP3
2110P%=B%
2120[OPT I%
2130\
2140\ Poke on screen
2150\
2160.poke PHA:TYA:PHA
2170LDY&71:LDA LSB,Y:STA&80
2180LDA MSB,Y:STA&81:LDY#0
2190.P1 CLC:LDA&80:ADC&70:STA&80
2200LDA&81:ADC#0:STA&81
2210DEY:BNE P1
2220LDY#0
2230.P2 LDA(&80),Y:EOR(&72),Y:STA(&80),Y
2240INY:CPY&74:BNE P2
2250PLA:TAY:PLA:RTS
2260\
2270\ Update score
2280\
2290.score PHA:LDA#17:JSR&FFEE:LDA#130:
     JSR&FFEE:LDA#17:JSR&FFEE:LDA#4:JSR&FFEE
2300LDA#31:JSR&FFEE:LDA#1:JSR&FFEE:LDA#2:JSR&FFEE
2310LDA SC+2:AND#15:CLC:ADC#48:JSR&FFEE
2320LDA SC+1:JSR bcd:LDA SC:JSRbcd
2330LDA BO:CMP#1:BNE UB1:PLA:RTS
2340.UB1 LDA SC+1:CMP#&50:BCS UB2:PLA:RTS
2350.UB2 LDA#1:STA BO:LDA SOU:CMP#1:BNE UB3
2360TXA:PHA:TYA:PHA:LDA#7:LDX#Soundbonus MOD256
2370LDY#Soundbonus DIV256:JSR&FFF1:PLA:TAY:PLA:TAX
2380.UB3 LDA#17:JSR&FFEE:LDA#6:JSR&FFEE
2390INC BH:LDA BH:ASL A:CLC:ADC#10:STA&93
2400LDA#31:JSR&FFEE:LDA&93:JSR&FFEE:LDA#1
2410JSR&FFEE:LDA#230:JSR&FFEE:LDA#31:JSR&FFEE
2420LDA&93:JSR&FFEE:LDA#2:JSR&FFEE:LDA#231
2430JSR&FFEE:PLA:RTS
2440\
2450\ Print a bcd number
2460\
2470.bcd PHA:LSRA:LSRA:LSRA:LSRA:CLC
2480ADC#48:JSR&FFEE:PLA:PHA:AND#15:CLC
2490ADC#48:JSR&FFEE:PLA:RTS
2500.add PHA:CLC:SED:ADC SC:STA SC:LDA SC+1
2510ADC#0:STA SC+1:LDA SC+2:ADC#0:STA SC+2
2520CLD:PLA:RTS
2530\
2540\ Pause if necessary
2550\
2560.pause LDX PK:JSR test_key:BEQ PA1:RTS
2570.PA1 LDA#129:LDX SK:LDY#255:JSR&FFF4
2580CPX#255:BEQ PA2:LDA&FF:AND#128:CMP#128:BNE PA1
2590.PA2 RTS
2600\
2610\ peek on screen for mushrooms
2620\
2630.peek PHA:TYA:PHA:LDA#0:STA&7F
2640LDY&71:LDA LSB,Y:STA&80:LDA MSB,Y:STA&81
2650LDY#0
2660.PE1 CLC:LDA&80:ADC&70:STA&80:LDA&81
2670ADC#0:STA&81:DEY:BNE PE1:LDY#0
2680.PE2 LDA(&80),Y:AND#&44:CMP#&44:BEQ PE3
2690LDA(&80),Y:AND#128:CMP#128:BEQ PE3
2700.PE4 INY:CPY&74
2710BNE PE2:PLA:TAY:PLA:RTS
2720.PE3 INC&7F:JMP PE4
2730\
2740\ Test if hit a segment
2750\
2760.test_if_hit_segment PHA:LDX#0
2770.TIH2 LDA CT,X:CMP#0:BEQ TIH1:LDA CY,X:CMP&71
2780BNE TIH1:LDA CX,X:CLC:ADC#3:CMP&70
2790BCC TIH1:LDA CX,X:SEC:SBC&75:CMP&70
2800BCS TIH1:PLA:RTS
2810.TIH1 INX:CPX#15:BNE TIH2:LDX#255:PLA:RTS
2820\
2830\ Test and kill extra objects
2840\
2850.test_and_kill PHA:TXA:PHA:LDA ST:CMP#0:BEQ TAK1
2860LDA SY:CMP&71:BNE TAK1:LDA SX:CLC:ADC#4
2870CMP&70:BCC TAK1:LDA SX:SEC:SBC#1
2880CMP&70:BCS TAK1:JSR kill_snail:JMP TAK2
2890.TAK1 LDA AD:CMP#0:BEQ TAK3:LDA AY
2900CMP&71:BNE TAK3:LDA AX:CLC:ADC#4:CMP&70
2910BCC TAK3:LDA AX:SEC:SBC#1:CMP&70:BCS TAK3
2920JSR kill_ant:JMP TAK2
2930.TAK3 LDA SPD:CMP#0:BEQ TAK4:LDA SPY:CMP&71
2940BNE TAK4:LDA SPX:CLC:ADC#8:CMP&70
2950BCC TAK4:LDA SPX:SEC:SBC#1:CMP&70
2960BCS TAK4:JSR kill_small_spider:JMP TAK2
2970.TAK4 LDA DY:CMP#0:BEQ TAK5
2980LDA DY:CMP&71:BNE TAK5
2990LDA DX:CLC:ADC#4:CMP&70:BCC TAK5
3000LDA DX:SEC:SBC&75:CMP&70:BCS TAK5
3010JSR kill_drop
3020.TAK2 JSR score
3030.TAK5 PLA:TAX:PLA:RTS
3040\
3050\ Kill snail
3060\
3070.kill_snail JSR bang:LDX ST:LDA SLB,X
3080STA&72:LDA SHB,X:STA&73:LDA SX:STA&70
3090LDA SY:STA&71:LDA#32:STA&74:JSR poke
3100LDA#0:STA ST:LDX#10
3110.KS1 LDA#&50:JSR add:DEX:BNE KS1:LDA#1
3120STA&82:RTS
3130\
3140\ Make explosion sound
3150\
3160.bang PHA:LDA SOU:CMP#1:BEQ BA1:PLA:RTS
3170.BA1 TXA:PHA:TYA:PHA:LDA#7
3180LDX#Soundbang MOD256:LDY#Soundbang DIV256
3190JSR&FFF1:LDA#7
3200LDX#Soundendfire MOD256:LDY#Soundendfire DIV256
3210JSR&FFF1:PLA:TAY:PLA:TAX:PLA:RTS
3220\
3230\ Kill ant
3240\
3250.kill_ant JSR bang:LDA AX:STA&70
3260LDA AY:STA&71:LDA#ant MOD256:STA&72
3270LDA#ant DIV256:STA&73:LDA#32:STA&74
3280JSR poke:LDA#0:STA AD:LDX#5
3290.KA1 LDA#&50:JSR add:DEX:BNE KA1
3300LDA#1:STA&82:RTS
3310\
3320\ Kill small spider
3330\
3340.kill_small_spider JSR bang:LDA SPX:STA&70
3350LDA SPY:STA&71:LDA#spider MOD256:STA&72
3360LDA#spider DIV256:STA&73:LDA#64:STA&74
3370JSR poke:LDA#0:STA SPD:LDX#4
3380.KSS1 LDA#&50:JSR add:DEX:BNE KSS1
3390LDA#1:STA&82:LDA#7
3400LDX#Soundendspider MOD256
3410LDY#Soundendspider DIV256:JMP&FFF1
3420\
3430\ Move centipede
3440\
3450.move_centipede LDX#0
3460.MC2 LDA CT,X:CMP#0:BNE MC1
3470.MC9 INX:CPX#15:BNE MC2:RTS
3480.MC1 TAY:LDA CX,X:STA&70:LDA CY,X:STA&71
3490LDA CLB,Y:STA&72:LDA CHB,Y:STA&73
3500LDA#32:STA&74:JSR poke:CLC:LDA&70:ADC CD,X
3510STA&70:JSR peek:LDA&7F:CMP#0:BCS MC100
3520LDA&70:CMP#1:BCC MC100:CMP#74:BCS MC100:JMP MC3
3530.MC100 LDA CX,X:STA&70:INC&71:LDA&71:CMP#32
3540BNE MC5:LDA&FE64:AND#1:CLC:ADC#20:STA&71
3550LDA CD,X:CMP#255:BEQ MC4:LDA#0:STA&70:JMP MC5
3560.MC4 LDA#74:STA&70:JMP MC5
3570.MC5 LDA CD,X:CMP#255:BEQ MC6
3580LDA#255:JMP MC7
3590.MC6 LDA#1:.MC7 STA CD,X
3600.MC3 LDA CT,X:CLC:ADC#1:CMP#4:BNE MC8
3610LDA#1:.MC8 STA CT,X:TAY:LDA CLB,Y
3620STA&72:LDA CHB,Y:STA&73:JSR poke:LDA&70
3630STA CX,X:LDA&71:STA CY,X:JMP MC9
3640\
3650\ Move snail
3660\
3670.move_snail LDA SX:STA&70:LDA SY:STA&71
3680LDY ST:LDA SLB,Y:STA&72:LDA SHB,Y:STA&73
3690LDA#32:STA&74:JSR poke:LDA&70:CLC
3700ADC SDI,Y:STA&70:CMP#0:BEQ MS2:CMP#75
3710BCS MS2:STA SX:JSR poke:RTS
3720.MS2 LDA#0:STA ST:RTS
3730\
3740\ Move ant
3750\
3760.move_ant LDA AX:STA&70:LDA AY:STA&71
3770LDA#ant MOD256:STA&72:LDA#ant DIV256
3780STA&73:LDA#32:STA&74:JSR poke:LDA&70
3790CLC:ADC AD:CMP#0:BEQ MA1:CMP#75
3800BEQ MA1:STA&70:STA AX:JMP poke
3810.MA1 LDA#0:STA AD:RTS
3820\
3830\ Move small spider
3840\
3850.move_small_spider LDA SPX:STA&70
3860LDA SPY:STA&71:LDA#spider MOD256:STA&72
3870LDA#spider DIV256:STA&73:LDA#64:STA&74
3880JSR poke:LDA&70:CLC:ADC SPD:CMP#0:BEQ MSSP1
3890CMP#71:BEQ MSSP1:STA&70:STA SPX
3900LDA&71:CLC:ADC SDY:STA&71:STA SPY:CMP#31:BNE MSSP2
3910LDA#255:STA SDY:JMP MSSP3
3920.MSSP2 CMP SPH:BNE MSSP3
3930LDA#1:STA SDY
3940.MSSP3 JSR poke:RTS
3950.MSSP1 LDA#0:STA SPD
3960LDA#7:LDX#Soundendspider MOD256
3970LDY#Soundendspider DIV256:JMP&FFF1
3980\
3990\ Move man
4000\
4010.move_man LDA#0:STA&90:STA&91:STA&92
4020LDA JOY:CMP#1:BEQ MM1:LDX LK:JSR test_key
4030BNE MM2:LDA#255:.MM3 STA&90:LDA#1:STA&92:JMP MM4
4040.MM2 LDX RK:JSR test_key:BNE MM4:LDA#1:JMP MM3
4050.MM4 LDX UK:JSR test_key:BNE MM5:LDA#255
4060.MM6 STA&91:LDA#1:STA&92:JMP MM7
4070.MM5 LDX DK:JSR test_key:BNE MM7
4080LDA#1:JMP MM6
4090.MM1 LDA#128:LDX#1:JSR&FFF4:CPY#30
4100BCS MM8:LDA#1:.MM9 STA&90:LDA#1:STA&92:JMP MM10
4110.MM8 CPY#210:BCC MM10:LDA#255:JMP MM9
4120.MM10 LDA#128:LDX#2:JSR&FFF4:CPY#30
4130BCS MM11:LDA#1:.MM12 STA&91:LDA#1:STA&92:JMP MM7
4140.MM11 CPY#200:BCC MM7:LDA#255:JMP MM12
4150.MM7 LDA XM:STA&70:LDA#4:STA&75:LDA YM
4160STA&71:LDA#40:STA&74:JSR test_if_hit_segment
4170CPX#255:BEQ MM13:.MM14 LDA#1:STA DF:RTS
4180.MM13 LDA#0:STA&82:JSR test_and_kill
4190LDA&82:CMP#1:BEQ MM14:INC&71
4200JSR test_if_hit_segment:CPX#255:BNE MM14
4210JSR test_and_kill:LDA&82:CMP#1:BEQ MM14
4220LDA&92:CMP#1:BEQ MM15:RTS
4230.MM15 DEC&71:LDA#Mdata MOD256:STA&72
4240LDA#Mdata DIV256:STA&73:JSRpoke
4250INC&71:LDA#(Mdata+40) MOD256:STA&72
4260LDA#(Mdata +40)DIV256:STA&73:JSRpoke
4270LDA&70:CLC:ADC&90:CMP#0:BNE MM16:LDA#1
4280.MM16 CMP#74:BNE MM17:LDA#73
4290.MM17 STA&70:LDA YM:CLC:ADC&91:CMP#31
4300BNE MM18:LDA#30
4310.MM18 CMP#20:BNE MM19:LDA#21
4320.MM19 STA&71:INC&71:JSR peek:LDA&7F:DEC&71
4330CMP#0:BCS MM20:LDA&70:STA XM:LDA&71:STA YM
4340.MM20 LDA XM:STA&70:LDA YM:STA&71
4350LDA#Mdata MOD256:STA&72:LDA#Mdata DIV256
4360STA&73:JSRpoke:INC&71
4370LDA#(Mdata+40) MOD256:STA&72
4380LDA#(Mdata+40) DIV256:STA&73:JSRpoke
4390DEC&71:JSR test_if_hit_segment:CPX#255
4400BEQ MM21:.MM22 LDA#1:STA DF:RTS
4410.MM21 LDA#0:STA&82:JSR test_and_kill
4420LDA&82:CMP#1:BEQ MM22:INC&71
4430JSR test_if_hit_segment:CPX#255
4440BNE MM22:JSR test_and_kill:LDA&82
4450CMP#1:BEQ MM22:RTS
4460\
4470\ Test key
4480\
4490.test_key LDA#129:LDY#255:JSR&FFF4
4500CPX#255:RTS
4510\
4520\ Fire spray
4530\
4540.fire_spray LDA JOY:CMP#1:BEQ FS1
4550LDX FK:JSR test_key:BEQ FS2:RTS
4560.FS1 LDA#128:LDX#0:JSR&FFF4:TXA:AND#1
4570CMP#1:BEQ FS2:RTS
4580.FS2 LDA XM:CLC:ADC#2:STA MX:STA&70:LDA YM:STA MY
4590STA&71:LDA#0:STA&74:LDA#bullet MOD256
4600STA&72:LDA#bullet DIV256:STA&73:JSR poke
4610LDA SOU:CMP#1:BNE FS3
4620LDX#Soundfire MOD256:LDY#Soundfire DIV256
4630LDA#7:JSR&FFF1
4640.FS3 JMP move_spray
4650\
4660\ Main program
4670\
4680.main_prog INC CO:JSR pause:JSR move_man
4690JSR move_centipede:LDA MY:CMP#0:BEQ MP1
4700JSR move_spray:JMP MP2
4710.MP1 JSR fire_spray
4720.MP2 LDA CO:AND SNF:CMP#0:BNE MP3
4730LDA ST:CMP#0:BEQ MP3:JSR move_snail
4740.MP3 LDA CO:AND SPF:CMP#0:BNE MP5:LDA SPD
4750CMP#0:BEQ MP5:JSR move_small_spider
4760.MP5 LDA CO:AND AGF:CMP#0:BNE MP6
4770LDA AD:CMP#0:BEQ MP6:JSR move_ant
4780.MP6 LDA CO:AND DS:CMP#0:BNE MP300
4790LDA DY:CMP#0:BEQ MP300:JSR move_drop
4800.MP300 LDA CO:CMP#30:BNE MP100
4810LDA ST:CMP#0:BNE MP100
4820LDA&FE64:AND#1:CLC:ADC#1:STA ST:TAY
4830LDA#0:STA&70:STA SX:CPY#2
4840BNE MP101:LDA#74:STA&70:STA SX
4850.MP101 LDA&FE64:AND#15:ADC#5:STA&71:STA SY
4860LDA#32:STA&74:LDA SLB,Y:STA&72:LDA SHB,Y
4870STA&73:JSR poke
4880.MP100 LDA CO:CMP#1:BNE MP10:LDA SPD:CMP#0:BNE MP10
4890LDA&FE64:AND#1:CMP#1
4900BEQ MP11:LDA#0:STA SPX:LDA#1:STA SPD:JMP MP12
4910.MP11 LDA#71:STA SPX:LDA#255:STA SPD
4920.MP12 LDA SPX:STA&70:LDA#255:STA SDY
4930LDA#31:STA SPY:STA&71:LDA#64:STA&74
4940LDA#spider MOD256:STA&72:LDA#spider DIV256
4950STA&73:JSR poke:LDA SOU:CMP#1:BNE MP10
4960LDA#7:LDX#Soundspider MOD256
4970LDY#Soundspider DIV256:JSR&FFF1
4980.MP10 LDA WA:CMP#2:BCC MP13:LDA AD
4990CMP#0:BNE MP13:LDA CO:CMP#5
5000BNE MP13:LDA&FE64:AND#1:CMP#1:BEQ MP14
5010LDA#0:STA AX:LDA#1:JMP MP15
5020.MP14 LDA#74:STA AX:LDA#255
5030.MP15 STA AD:LDA AX:STA&70:LDA&FE64
5040AND#15:CLC:ADC#4:STA&71:STA AY
5050LDA#ant MOD256:STA&72:LDA#ant DIV256
5060STA&73:LDA#32:STA&74:JSR poke
5070.MP13 LDY SP
5080.MP19 LDX#255:.MP20 NOP:DEX:BNE MP20
5090DEY:BNE MP19
5100LDY#0:JSR move_spit:LDA CO:AND#1:CMP#1
5110BNE MP21:LDY#1:JSR move_spit
5120.MP21 LDA WA:CMP#4:BCC MP22:LDA BY:CMP#0
5130BNE MP22:LDA SSPD:CMP#1:BNE MP22:LDA SPD:CMP#0:BEQ MP22:LDA SPX
5140CLC:ADC#5:STA &70:STA BX:LDA SPY:CLC:ADC#1
5150STA&71:STA BY:LDA#0:STA&74:LDA#bullet MOD256
5160STA&72:LDA#bullet DIV256:STA&73:JSR poke
5170LDA SOU:CMP#1:BNE MP22:LDA#7
5180LDX#Soundspit MOD256:LDY#Soundspit DIV256
5190JSR&FFF1
5200.MP22 LDA WA:CMP#3:BCC MP23:LDA BY+1:CMP#0
5210BNE MP23:LDA AGFD:CMP#1:BNE MP23:LDA AD:CMP#0:BEQ MP23:LDA AX
5220CLC:ADC#2:STA &70:STA BX+1:LDA AY:CLC
5230ADC#1:STA&71:STA BY+1:LDA#0:STA&74
5240LDA#bullet MOD256:STA&72:LDA#bullet DIV256
5250STA&73:JSR poke:LDA SOU:CMP#1:BNE MP23
5260LDA#7:LDX#Soundspit MOD256:LDY#Soundspit DIV256
5270JSR&FFF1
5280.MP23 LDA DO:CMP#1:BNE MP200
5290LDA DY:CMP#0:BNE MP200
5300LDA#5:STA&71:STA DY:LDA#32:STA&74
5310LDA&FE64:AND#63:CLC:ADC#8:STA&70:STA DX
5320LDA#drop MOD256:STA&72:LDA#drop DIV256:STA&73:JSR poke
5330.MP200 LDA DF:CMP#1:BEQ MP24
5340LDA SL:CMP#0:BEQ MP24
5350LDA&FF:AND#128:CMP#128:BEQ MP24
5360LDX#0
5370.MP500 LDA CT,X:CMP#0:BEQ MP501
5380JMP main_prog
5390.MP501 INX:CPX#15:BNE MP500
5400LDA#0:STA SL
5410.MP24 RTS
5420\
5430\ Move spit
5440\
5450.move_spit LDA BY,Y:CMP#0:BNE MSP1:RTS
5460.MSP1 STA&71:LDA BX,Y:STA&70:LDA#0:STA&74
5470LDA#bullet MOD256:STA&72:LDA#bullet DIV256
5480STA&73:JSR poke:LDA&71:CMP YM:BNE MSP2
5490.MSP4 LDA&70:CLC:ADC#1:CMP XM:BCC MSP3
5500LDA&70:SEC:SBC#4:CMP XM:BCS MSP3
5510.MSP9 LDA#0:STA BY,Y:LDA#1:STA DF:RTS
5520.MSP2 CLC:ADC#1:CMP YM:BNE MSP3:JMP MSP4
5530.MSP3 LDA BY,Y:CLC:ADC#1:STA BY,Y:STA&71
5540CMP#32:BCC MSP5:LDA#0:STA BY,Y:RTS
5550.MSP5 LDA&71:CMP YM:BNE MSP6
5560.MSP7 LDA&70:CLC:ADC#1:CMP XM:BCC MSP8
5570LDA&70:SEC:SBC#4:CMP XM:BCS MSP8:JMP MSP9
5580.MSP6 CLC:ADC#1:CMP YM:BNE MSP8:JMP MSP7
5590.MSP8 JMP poke
5600\
5610\ Move spray
5620\
5630.move_spray LDA MY:STA&71:LDA MX:STA&70
5640LDA#bullet MOD256:STA&72:LDA#0:STA&74
5650LDA#bullet DIV256:STA&73
5660LDA#1:STA&75:JSR test_if_hit_segment
5670CPX#255:BEQ MR1:JSRpoke
5680.MR9 LDA CX,X:STA&70:LDA CY,X:STA&71:LDA#32
5690STA&74:LDA CT,X:TAY:LDA CLB,Y:STA&72
5700LDA CHB,Y:STA&73:JSRpoke:LDA#0:STA MY
5710STA CT,X:LDA#&25:JSRadd:JSR bang:JSR score
5720DEC SL:JMP MR7
5730.MR1 LDA#0:STA&82:JSR test_and_kill
5740LDA &82:CMP#1:BNE MR2
5750LDA MX:STA&70:LDA MY
5760STA&71:LDA#bullet MOD256:STA&72:LDA#bullet DIV256
5770STA&73:LDA#0:STA&74:JSR poke:JMP MR7
5780.MR2 JSRpoke:LDA MY:SEC:SBC#1:STA&71:STA MY
5790CMP#3:BNE MR3
5800.MR7 LDA#0:STA MY:LDA SOU:CMP#1:BEQ MR4:RTS
5810.MR4 LDA#7:LDX#Soundendfire MOD256
5820LDY#Soundendfire DIV256:JSR&FFF1:RTS
5830.MR3 JSR peek:LDA&7F:CMP#1:BCC MR5
5840LDY#0:LDA#0
5850.MR6 STA(&80),Y:INY:CPY#8:BNE MR6
5860JMP MR7
5870.MR5 JSR test_if_hit_segment:CPX#255:BEQ MR8
5880JMP MR9
5890.MR8 LDA#0:STA&82:JSR test_and_kill
5900LDA&82:CMP#1:BNE MR10:JMP MR7
5910.MR10 JMP poke
5920\
5930\ Move dropping
5940\
5950.move_drop LDA DY:STA&71:LDA DX:STA&70
5960LDA#32:STA&74:LDA#drop MOD256:STA&72
5970LDA#drop DIV256:STA&73:JSRpoke:LDA&FE64:AND#3
5980CMP#0:BNE MD1:LDA DY:CMP#30:BCS MD1
5990CMP#6:BCC MD1:LDA#Toad MOD256
6000STA&72:LDA#Toad DIV256:STA&73:JSRpoke
6010.MD1 INC&71:LDA&71:CMP#32:BEQ MD2
6020STA DY:LDA#drop MOD256:STA&72:LDA#drop DIV256
6030STA&73:JSRpoke:RTS
6040.MD2 LDA#0:STA DY:RTS
6050\
6060\ Kill dropping
6070\
6080.kill_drop JSRbang:LDA DX:STA&70:LDA DY:STA&71
6090LDA#drop MOD256:STA&72:LDA#drop DIV256:STA&73
6100LDA#32:STA&74:JSRpoke:LDA#0:STA DY
6110LDA#1:STA&82:LDA#&50:JMP add
6120]
6130NEXT
6140LK=-98:RK=-67:UK=-73:DK=-105:FK=-74:PK=-56:SK=-82
6150FORI%=0TO9
6160$(&500+I%*6)=RIGHT$("0000"+STR$((10-I%)*500),5)
6170$(&850+I%*16)=STRING$(15,".")
6180NEXT
6190CLS
6200PRINT'''"Are you ready to save the machine code?"
6210PRINT'''"Press then SPACE BAR if ready.."
6220REPEAT UNTIL GET=32
6230*FX18
6240*KEY10*SAVE Cent1 3000+E00|M
6250FORI%=0TO&64
6260I%?&D00=I%?&B00
6270NEXT
6280PRINT''"Press the BREAK key"
```



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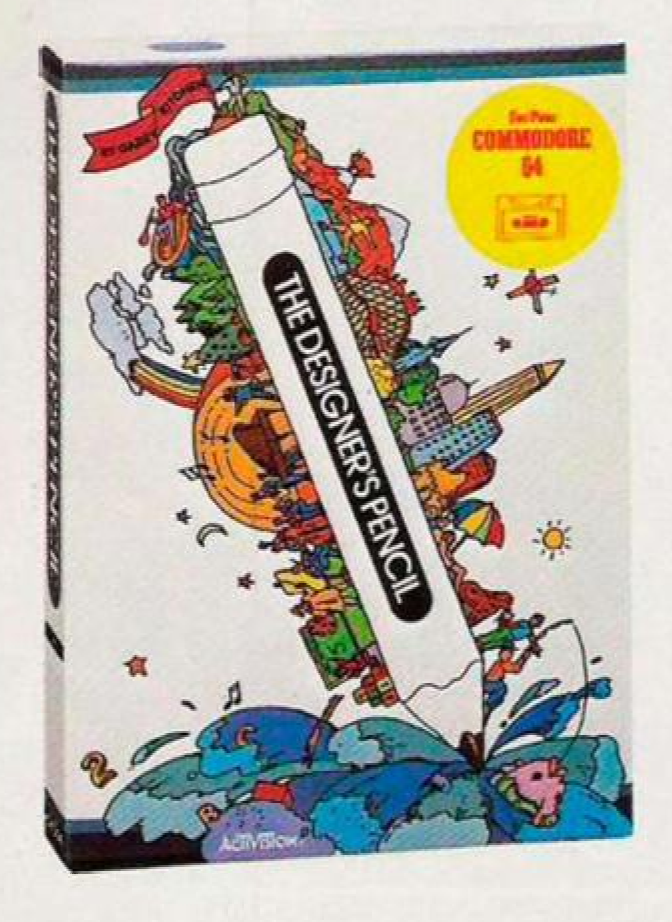
All of which makes MSX the system of the future.

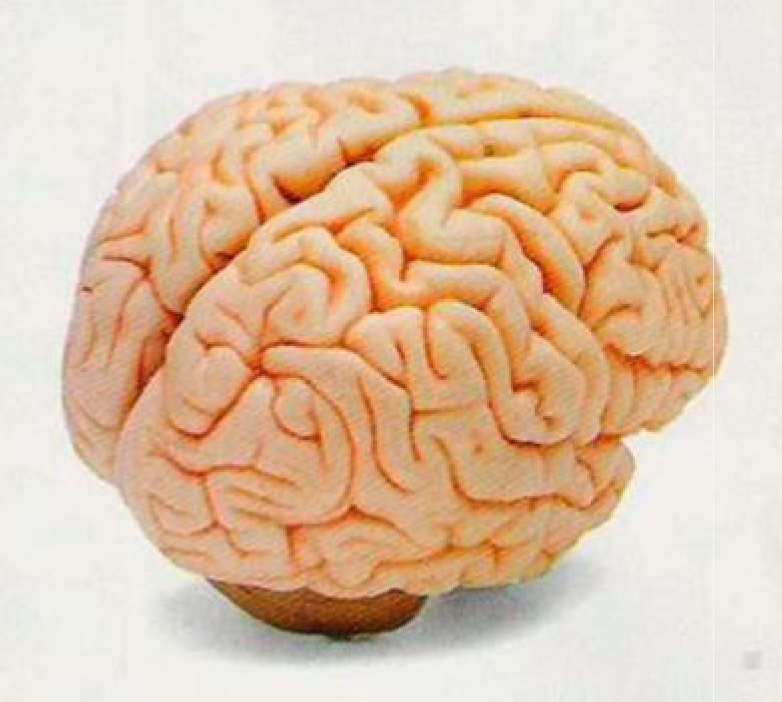
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TOSHIBA MSX

FOR MORE INFORMATION ON THE TOSHIBA HX10 CONTACT TOSHIBA (UK) LTD., TOSHIBA HOUSE, FRIMLEY ROAD, FRIMLEY, SURREY GU16 5JJ. TEL: (0276) 681691.

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ASTEROIDS

Mike Pike steers a dangerous path.

I HAVE USED the method of entering machine code adopted several times by *Your Computer* i.e., look at the Froggie game for the ZX-81 in the February 1985 issue. My programs 1 and 2 are identical to the programs 1 and 2 in this issue. A hex dump should be obtained in identical format to that in the Froggie program by typing Run 1000.

Obtain a listing of the hex dump on the printer before running the program as running will change the values of the addresses in the Rem used for storing data. These data addresses will be set to zero before running. Changing the values in the data addresses will not affect the running of the program but it may confuse anyone checking the listing, if they have entered it incorrectly and run it, as they may think that its failure is due to the fact that they have entered these data addresses incorrectly.

Program 1 can be obtained from the listing at line 100 and program 2 from the listing at 300. Line 1000 when run will Llist the hex dump on the printer.

The machine code is contained in a Rem statement in line 0, this should contain at least 4542 bytes: Start address — 16514; Finish address — 21055.

The Rem is obtained by typing:

```
1 REm 160 characters
```

This is five full lines of X's or any other single character. Edit line 1 and change it to line 2, edit line 2 and change it t line 3 and so on until you have entered lines 1 to 29 in this way. Then type in:

```
POKE 16510,0
POKE 16511,202
POKE 16512,18
```

You now have one Rem at line 0 with more than enough room for the machine code. Now enter the hexidecimal loader, program 1. Run it and type in the machine code in the hex dump. Do not enter the numbers in the left column as these are the addresses of the next hex codes. Enter the hex codes in eight pairs at a time and then enter the number on the far right of each row when prompted by the equals sign. If the number does not match the hex codes you will be asked to enter the last line of hex again.

The hex between addresses 16581 and 16930 are used for data storage and need not be 00, they change after the program has been run once. If the program works after entering the following lines and saving a few times, the hex loader can be deleted.

Enter the following lines, Save and Run:

```
 8 RAND
10 LET L = USR 20336
15 IF INKEYS<> "" THEN GOTO 15
```

If the program crashes or fails to work properly the reload it from tape and enter the hex checker, program 2. Type Run 300 and inut the start and finish address and check that the hex agrees with the listing. When using the hex checker type Cont when the screen is full to continue. Change any mistake by using the hex loader and re-enter the line of hex containing the mistake.

The controls are: 1/3 rotate left/right; 9 fire; 7 thrust; Y hyperspace.

The game gives instructions when run, contains a 1/2 player option and a high score table of the three highest scorers.

Hex dump.

```
16514-E5D52A0240545D29 = 816
16522-2919292929192232 = 298
16530-407CD1E1C9008701 = 959
16538-6101800183A38101 = 683
16546-8001800180A38001 = 678
16554-80018001800105A4 = 556
16562-84018001800101A2 = 554
16570-02010100810182A1 = 425
16578-8401010000000000 = 134
16586-0000000000000000 = 0
16594-0000000000000000 = 0
16602-0000000000000000 = 0
16610-0000000000000000 = 0
16618-0000000000000000 = 0
16626-0000000000000000 = 0
16634-0000000000000000 = 0
16642-0000000000000000 = 0
16650-0000000000000000 = 0
16658-0000000000000000 = 0
16666-0000000000000000 = 0
16674-0000000000000000 = 0
16682-0000000000000000 = 0
16690-0000000000000000 = 0
16698-0000000000000000 = 0
16706-0000000000000000 = 0
16714-0000000000000000 = 0
16722-0000000000000000 = 0
16730-0000000000000000 = 0
16738-0000000000000000 = 0
16746-0000000000000000 = 0
16754-0000000000000000 = 0
16762-0000000000000000 = 0
16770-0000000000000000 = 0
16778-0000000000000000 = 0
16786-0000000000000000 = 0
16794-0000000000000000 = 0
16802-0000000000000000 = 0
16810-0000000000000000 = 0
16818-0000000000000000 = 0
16826-0000000000000000 = 0
16834-0000000000000000 = 0
16842-0000000000000000 = 0
16850-0000000000000000 = 0
16858-0000000000000000 = 0
16866-0000000000000000 = 0
16874-0000000000000000 = 0
16882-0000000000000000 = 0
16890-0000000000000000 = 0
16898-0000000000000000 = 0
16906-0000000000000000 = 0
16914-0000000000000000 = 0
16922-0000000000000000 = 0
16930-0000000000000000 = 0
16938-0000030362614142 = 332
16946-8201A1A20F0A0807 = 616
16954-2684128138821361 = 682
```

(continued on page 89)


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Hexloader

```
100 REM ***HEX LOADER***
105 CLS
110 PRINT "START ADDRESS"
115 INPUT S
120 PRINT "FINISH ADDRESS"
125 INPUT F
130 FOR N=S TO F STEP 8
135 LET T=0
140 SCROLL
145 PRINT N;"-";
150 INPUT A$
155 PRINT A$;"=";
160 INPUT TOT
165 PRINT TOT
170 LET Z=0
175 FOR K=1 TO LEN A$ STEP 2
180 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
185 LET T=T+C
190 POKE N+Z,C
195 LET Z=Z+1
200 NEXT K
205 IF TOT=T THEN GOTO 225
210 SCROLL
215 PRINT "ERROR-PLEASE INPUT A
GAIN"
220 GOTO 135
225 NEXT N
230 STOP
```

(continued from page 87)

```
16962-4041018100A12102 = 583
16970-000000000016030E = 45
16978-0905090409050A12 = 69
16986-090103CEC4C5A400 = 776
16994-0200010203040506 = 23
17002-070786058483B231 = 931
17010-8016132197401110 = 450
17018-0ACC054E23462365 = 859
17026-CD21430CDCFA4278 = 1146
17034-CB7F2804FD67047 = 616
17042-7ECB7F2809FE8830 = 843
17050-092FD6701806FE08 = 674
17058-38023E00805F1600 = 413
17066-E5216342197EE177 = 922
17074-D1E1C10D20C4C9C5 = 1266
17082-4E2D4623E5CD1443 = 739
17090-D5CDFA4276CD7F28 = 1224
17098-042FD670477ECB7F = 904
17106-2809FE8830092FD6 = 757
17114-7018006FE0838023 = 564
17122-00F5A047F1A85F16 = 1002
17130-00E5216342197EE1 = 403
17138-7701E1C10D20C0C9 = 1184
17146-2101001415280A7D = 250
17154-C6216F7CCE00671B = 799
17162-F3160019ED5B0C40 = 694
17170-19C9C579C05F200C = 902
17178-E61F03E2038020 6 = 950
17186-205F180CE61F4F7B = 626
17194-91F62047E0F0D6C = 814
17202-C1C879200CC87120 = 902
17210-0BC97A3CFE163802 = 720
17218-3E0057C97A3DFEFF = 1042
17226-20023E1557C9ED5B = 730
17234-6242CB4E200521C8 = 709
17242-4018032174417E06 = 437
17250-0823C5475000C81F = 588
17258-10F7C9E5C5F57EF5 = 1506
17266-3E08904F06002A62 = 439
17274-4282402005210E40 = 686
17282-180021774109095E = 1000
17290-E823560E02181972 = 350
17298-40CDB942D1E1F1E5 = 1424
17306-212E42058F4ECD14 = 692
17314-43E17323720E1321 = 622
17322-9740CD7C42F1C1E1 = 1269
17330-1884ED5B6242CB4B = 974
17338-200521C540150321 = 391
17346-74417E0608CB4720 = 627
17354-05CB1F10F5C9E5C5 = 1130
17362-F53E08904F06002A = 586
17370-6242CB40200521CE = 720
17378-4018032174410609 = 332
17386-5E23560E17219740 = 496
17394-CD7C42F1C1E11001 = 1287
17402-ED5B6242CB4B2005 = 807
17410-210E401803218041 = 585
17418-7E234E0610C23CB47 = 570
17426-20071E19CB1F10F5 = 762
17434-C9E5C5F57EF53E10 = 1321
17442-904F06002A6242CB = 635
17450-4D200521F0401803 = 475
17458-219F4109095EE523 = 633
17466-56D50E04218D40CD = 808
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28972: 2CC4A855F1F5CA48 = 1251
28980: 84CD3C5CFE3CC4A6 = 1165
28988: 55F177E5F50F0028 = 976
28996: 3A3D8CFE20C2A384 = 1034
29004: F1F547CA5684CDE8 = 1414
29012: 580CFF80CAA884FE = 1155
29020: 3ECAA384C33784CD = 1146
29028: 365CD63C32A48DCC = 979
29036: FD58C3B284CDF058 = 1284
29044: FE0DCA9984F53AA4 = 1221
29052: 8DB7CA7B84F111A3 = 1202
29060: 84D5FE20C3FE09C8 = 1294
29068: FE3BC8FE2CC8D1C3 = 1415
29076: 9384F1FE3CCA0F84 = 1311
29084: FE3EC293840405CA = 1000
29092: A38405C3938404C3 = 973
29100: 93840C7720C35684 = 866
29108: 3AA48DB7C2A384CD = 1240
29116: D65536002BCD8A7E = 865
29124: 78B7C4A655F1E122 = 1250
29132: 9F8D26006922398D = 765
29140: C1D1E101C9B4C388 = 1340
29148: 82AFC23E01C3F083 = 1128
29156: C1018A82C52A888D = 1077
29164: 3E0132A68DE5CD4C = 930
29172: 82F5CDA47ECA0D85 = 1218
29180: F1E1FE0DCA1280FE = 1335
29188: 3BCA0780FE27CAFD = 1144
29196: 84FE22CAFD84CD9A = 1366
29204: 7FC3E38447CDF17E = 1324
29212: FE0DCA12B088CAF7 = 1248
29220: 84C3FE84F1E12288 = 1400
29228: 8DAFCD8C88CDEF88 = 1377
29236: C1D1E121DB53E5D5 = 1404
29244: 2AB98DE5E52A9F8D = 1168
29252: E52A938DE521DB53 = 1123
29260: E5213885E5C5C9CD = 1283
29268: 5583C1E1D13E0132 = 956
29276: A88D22A18DE1CD96 = 1223
29284: 5EC269853A9C8DB7 = 1064
29292: C2598578B1C26985 = 1145
```

SPACE EVADERS

THIS GAME for the 16K or 48K Spectrum is based on the popular arcade game Space Invaders. The object as usual is to stop the five attack waves of aliens, each of which vary in speed and fire power from reaching Earth. You, as the sole survivor of the first attack wave, have to destroy all the aliens while avoiding their bombs.

Hexloader.

```
  5 CLEAR 24449
 10 DEF FN x(a$)=CODE a$-48-7*(a$>"9")
 20 INPUT "Start Address ";s
 30 FOR n=s TO 32404 STEP 8
 40 PRINT n;": ";: LET tot=0
 50 INPUT a$: IF a$="END" THEN STOP
 60 PRINT a$;" = ";: INPUT t: PRINT t
 70 FOR k=1 TO LEN a$ STEP 2: LET z=0
 80 LET c=16*FN x(a$(k))+FN x(a$(k+1)): LET tot=tot+c
 90 POKE n+z,c: LET z=z+1:NEXT k
100 IF tot<>t THEN PRINT "Error - input again": GO TO 40
110 NEXT n
```

Justin Staines evades the invaders.

The number of space ships you have depends on the amount of skill shown on the first game, ie. reasonably good, three ships — excellent, two ships.

To move use Z — left, X — right, Space — fire. You can, if you have one, use the Sinclair ZX Interface Two (R) which, by the way, uses keys 1, 2 and 5.

When entering the program, type and run listing one — the loader and then you can enter the code in figure 2. After you have entered the, approximately, 8167 bytes, you can Save the code with

SAVE "EVADERS" CODE 24500,8167

then Verify it with

VERIFY " " CODE

You can now play the game with

RANDOMIZE USR 24703



Of course, if you don't want to have to load the game and then type the above you could have a small program before the code — for example:

10 LOAD " " CODE
20 RANDOMIZE USR 24703

and save it with

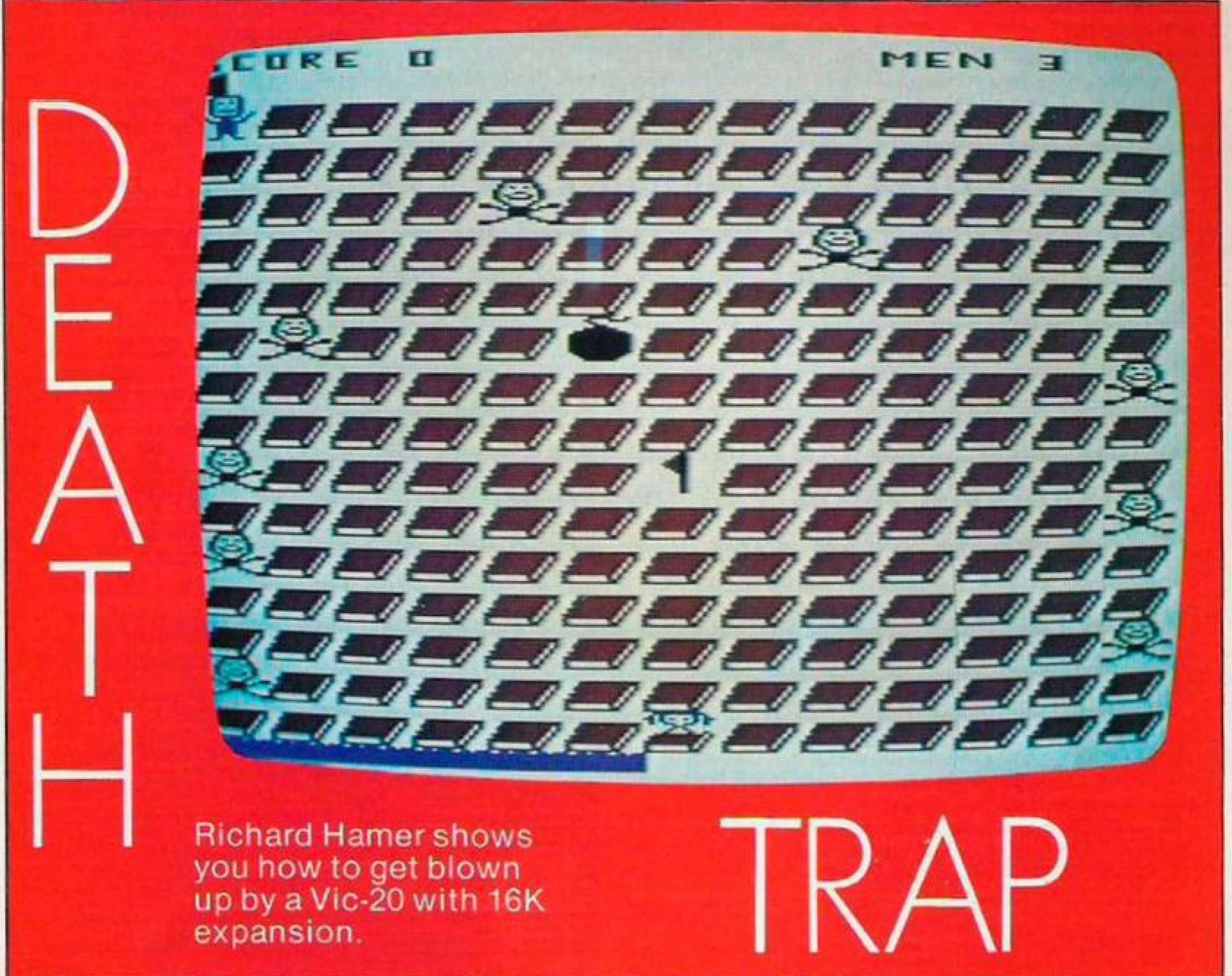
SAVE "EVADERS" LINE 10

29300:	2AA16D23237EFE08	=	802
29308:	23D25E8528C31D83	=	870
29316:	EBD5CDC38887CA98	=	1513
29324:	85110A8BCDC38887	=	1146
29332:	FC4A80CD3E89CD34	=	1115
29340:	82FE80C27585E52A	=	1112
29348:	A10DE5C5C349830B	=	1138
29356:	626BD1C34D85CD08	=	1243
29364:	5CFE00CAA6554FCD	=	1096
29372:	DA93CD3C5CFE0DCA	=	1191
29380:	8285CD0A93A8C2A3	=	1423
29388:	853E00CD0A933E0A	=	850
29396:	CDDA933A3D0CFE20	=	1115
29404:	C0C3535CCDD85CFE	=	1332
29412:	0DCAA65532A3BD4F	=	899
29420:	CDFD5BFE00CAE005	=	1375
29428:	89CA535CC30185E1	=	1324
29436:	D1C101E985C38882	=	1278
29444:	C1018A82C5218008	=	1017
29452:	3AA38D4F7EB9CA01	=	955
29460:	86FE00CD23C3F585	=	1209
29468:	C1D1E121D853E505	=	1404
29476:	C5C9B7CDDD5FC21C	=	1323
29484:	86E523235E2356CD	=	853
29492:	E887E123228CBD7E	=	1065
29500:	F62877C05A7E2290	=	1017
29508:	8D0E00C5CDC580C1	=	1075
29516:	0CFE2CCA2C86AF77	=	984
29524:	2832A58032A8A03C	=	821
29532:	772022A70D22A980	=	848
29540:	3A0079320000CD8C	=	887
29548:	88AFCD8C88C1D1E1	=	1419
29556:	210000E5D5C5C9C1	=	1296
29564:	01A82C52A8880DF5	=	1113
29572:	AF32A58D32A680CD	=	1093
29580:	4C02F5CDA47EDA85	=	1297
29588:	86CA8A86F132A580	=	1251
29596:	E1C3F384F1CD605C	=	1421
29604:	C4A6552AA98DF5C2	=	1238
29612:	9A863AA8803C32A8	=	939
29620:	8D11208C1A3C4F1A	=	530
29628:	77281380C2A80636	=	736
29636:	0022A980F1FE2CCA	=	1085
29644:	8886F122B880C9F1	=	1287
29652:	E1AF22800DCD0C88	=	1243
29660:	CDEF882A898D1105	=	970
29668:	0019EB2A83A0193A	=	705
29676:	A88D772A898DEB2A	=	1076
29684:	8C8D237323722A90	=	779
29692:	8DC0E67EC1D1E121	=	1362
29700:	CD03E5C5C5C9E537	=	1426
29708:	CD9C5ECD5A7F3600	=	939
29716:	28360122A18D280F	=	491
29724:	80CDE880470CCD49	=	926
29732:	5CCD0B5CFE0DCA2A	=	1119
29740:	87FE38CA2A87FE2C	=	1125
29748:	CA02B770FE20CA02	=	949
29756:	87FE09C4D655C302	=	1090
29764:	87E323235E2356EB	=	882
29772:	CDD988E3B7CA4787	=	1376
29780:	89CA4787DA478736	=	1071
29788:	00280CCD39873600	=	496
29796:	28CD8A7EF1C1CD09	=	1352
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29812:	86000922ACBDC12A	=	597
29820:	A18DE521D853E811	=	1112
29828:	6E87D5C5C9CD5583	=	1277
29836:	E122A18DE122AE8D	=	1135
29844:	E1AF32A680CDC3A8	=	1293
29852:	87CA86871180A8C0	=	1185
29860:	C38887FC4A80CD3E	=	1235
29868:	89CD3482FE0DC288	=	1121
29876:	87E52AAE8DE52AA1	=	1153
29884:	8DE5C349322AA18D	=	1113
29892:	23AF329C8DC32283	=	917
29900:	7D835F7C9A57C93A	=	991
29908:	258CB7C2D055CD76	=	1170
29916:	773A3D8CFE20C032	=	906
29924:	258C2A148CEBCD81	=	996
29932:	87ED22268CC93A25	=	870
29940:	8CB7CCD855AF3229	=	1080
29948:	8CC3535C21878D4E	=	945
29956:	73234672CDF787CD	=	1126
29964:	008871237EC92A83	=	817
29972:	8D195E23562BC92A	=	807
29980:	83801923235E235E	=	[illegible]
29988:	2BC92A878D7D84C8	=	1117
29996:	2888E8D5CD000395	=	1192
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30012:	8580112000ED1922	=	665
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30028:	965ED1DA0A092A8E	=	1146
30036:	8D253A0988D7CD96	=	1050
30044:	5ED49A892A838DEB	=	1200
30052:	CDB187D5CDF787ED	=	1554
30060:	2A8B8DE878EC285F	=	1277
30068:	7882C26088D10573	=	1264
30076:	2372233E00772377	=	519
30084:	CD0088D1CA768873	=	1121
30092:	2372C37880EB2289	=	1057
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30108:	F787D173237278F6	=	1224
30116:	045FC9D5F52A880D	=	1120
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30148:	8288EB22888DF1D1	=	1361
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30164:	7883CA8808131313	=	787
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30196:	CDC388F5D5EB7BE6	=	1582
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30252:	F787712370C92A88	=	1072
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30348:	1F5FD52A838DF82A	=	978
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30724:	22000CD1CD3668E1	=	1006
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30748:	952130BC22388CCD	=	821
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30772:	E603470E06235E23	=	488
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30788:	0000000000020000	=	2
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30812:	0000000000000000	=	0
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30828:	0000000000000000	=	0
30836:	0000000000000000	=	0
30844:	0000000000000000	=	0
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30884:	79CDEF783A386087	=	1078
30892:	2000CDF37C8AFA00	=	870
30900:	CDD969CD8F793A39	=	1111
30908:	6087201ACD13793A	=	748
30916:	386087200C323960	=	582
30924:	3A3860ED44323860	=	723
30932:	C930323860C9CD58	=	958
30940:	793A3860473A3A60	=	614
30948:	8820883A38603C32	=	552
30956:	3860C93A3860FE01	=	821
30964:	280C3A8077907201	=	599
30972:	3E01323960C93A87	=	660
30980:	79473A88798DFE00	=	925
30988:	28EEAF323860C9CD	=	1061
30996:	F37C08FA003A8679	=	938
31004:	FE12D45F7A3A8679	=	1014
31012:	FE15281E470E00CD	=	635
31020:	FE70CD9465ED4885	=	1278
31028:	7984002A80379071	=	974
31036:	08DD7801CD8F79C3	=	998
31044:	DE793E01322560CD	=	794
31052:	F37CFA64FAC3FAFA	=	1667
31060:	FAFA00C9ED488579	=	1287
31068:	3A3B60814F18033E	=	718
31076:	04323860CDD969CD	=	938
31084:	8F79C0DE79C0F37C	=	1384
31092:	19F8647819F0003A	=	808
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31108:	0000000000000000	=	0
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31124:	4E00004601E04385	=	807
31132:	793A3C603CC8274F	=	716
31140:	0600DD093A85791F	=	579
31148:	3005016001D00900	=	602
31156:	22A0793A85794730	=	734
31164:	3C60CF2780328779	=	832
31172:	3A3C60473A306800	=	644
31180:	C827328879473A87	=	813
31188:	7938005280ED4432	=	925
31196:	79C9CD4779ED4885	=	1165
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31212:	043E08328E790E00	=	401
31220:	CDFE7DED530C79CD	=	1370
31228:	197A2A8879811600	=	471
31236:	0A220A7922A0C792	=	541
31244:	228C793A8E793E32	=	727
31252:	8E7920E3C9ED5B8C	=	1191
31260:	793A8779CD317A2A	=	853
31268:	8A79ED4B8B790600	=	834
31276:	ED803A897907C847	=	1183
31284:	AF121310FCC9CD57	=	973
31292:	7E3EF8A5B3772315	=	956
31300:	20F7C9ED4B85790F	=	1060
31308:	002112603A386085	=	490
31316:	6F3001247E5F1640	=	503
31324:	C33A783A220887C8	=	946
31332:	118050CD946511A0	=	856
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31348:	0465AF322860CDF3	=	1022
31356:	7CC800A0AC8C800A	=	764
31364:	C8C80A32FA00C9FF	=	1166
31372:	FFFFFFFFFFFFFF03	=	1788
31380:	0F1F3F7F7FFFFFC0	=	1065
31388:	F0F8FCFEFEFFFFFC	=	2010
31396:	F0E0C0800000003F	=	975
31404:	0F070301010000FF	=	282
31412:	FFFFFFFFFF000031	=	1324
31420:	3030320003030303	=	338
31428:	0035333343500000	=	209
31436:	3A226087C82A365C	=	781
31444:	E521267922365C3E	=	536
31452:	0332CA7CA0105142	=	435
31460:	887AC53E0332C87A	=	946
31468:	CD377E000D0D0D04	=	442
31476:	3ACB7A3D32CB7A20	=	851
31484:	EFC179C0094F3ACA	=	1099
31492:	7A3D32CA7A2008E1	=	1030
31500:	22365C3E01322280	=	423
31508:	C90000FE00FF0001	=	711
31516:	000200FFFF01FFFF	=	1023
31524:	0101013A226087C8	=	574
31532:	ED43157870FEA830	=	1040
31540:	58FEB83057CD4578	=	1157
31548:	C8CD387DCD021178	=	989
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31564:	CD88004F3A167800	=	858
31572:	860147DD23DD233A	=	776
31580:	377D17323770DC98	=	805
31588:	783ACA7A3D32CA7A	=	940
31596:	200AED4B157DCD98	=	1064
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31612:	78ED4B157A05CD98	=	941
31620:	78CDF37C0414041E	=	753
31628:	00FA01C9AFC9CDB2	=	1207
31636:	7CB677C9CDB27C2F	=	1180
31644:	A677C9CDB27CAE77	=	1286
31652:	C9CDB27CA8C98040	=	1267
31660:	2010000402010008	=	71
31668:	1018202830380109	=	226
31676:	111922129313902A	=	234
31684:	121A222A323A0308	=	242
31692:	131B232B333B040C	=	250
31700:	141C242C343C050D	=	258
31708:	151D252D353D060E	=	266
31716:	161E262E363E070F	=	274
31724:	171F272F373F4048	=	394
31732:	5058606870784149	=	730
31740:	515961697179424A	=	746
31748:	525A626A727A434B	=	754
31756:	535B636B737B444C	=	762
31764:	545C646C747C454D	=	770
31772:	555D656D757D464E	=	778
31780:	565E666E767E474F	=	786
31788:	575F676F777F8088	=	906
31796:	9098A0A8B0B88189	=	1250
31804:	9199A1A9B1B9828A	=	1258
31812:	929AA2AAB2BA838B	=	1266
31820:	939BA3ABB3BB848C	=	1274
31828:	949CA4ACB4BC858D	=	1282
31836:	959DA5ADB5BD868E	=	1290
31844:	969EA6AEB6BE878F	=	1298
31852:	979FA7AFB7BF0008	=	1034
31860:	1018202830380109	=	226
31868:	111921293139020A	=	234
31876:	121A222A323A030B	=	242
31884:	131B232B333B040C	=	506
31892:	949CA4ACB4BC858D	=	1282
31900:	959DA5ADB5BD868E	=	1290
31908:	969EA6AEB6BE878F	=	1298
31916:	979FA7AFB7BF2182	=	1237
31924:	78581600196669A7	=	632
31932:	CB1CCB1037CB1CCB	=	952
31940:	1DA7CB1CCB1DEB21	=	927
31948:	AA7B79E6074F0600	=	736
31956:	097EEBC9CD767E7E	=	1146
31964:	2387F0CD06004F7E	=	1028
31972:	23DD060147E5CD6A	=	1002
31980:	7EF118E8000000ED	=	847
31988:	53F07CD1C5F5E53A	=	1385
31996:	485CE6380F0F0FF6	=	741
32004:	0832F27C1A138728	=	692
32012:	0C6F1A134FCD2270	=	611
32020:	2020FA18EFE1F1C1	=	1249
32028:	D5ED5BF07CC93AF2	=	1406
32036:	7CC02C70000410FE	=	779
32044:	4100000010FAEF18	=	586
32052:	D3FEC9BA5D6C4D2A	=	1172
32060:	397DCB15CB14CB15	=	853
32068:	CB144C3A37701747	=	631
32076:	ED5B387DCB13CB12	=	952
32084:	CB8A2A377D092837	=	709
32092:	7D2A3972ED5ACB8C	=	1067
32100:	22397DF821377D23	=	704
32108:	C02318F83A0C0809	=	934
32116:	58270300000010F9	=	474
32124:	640A01DD21707D08	=	608
32132:	05005000500E0AF6	=	888
32140:	FFED5B3C30F819CC	=	1179
32148:	7700DC2310E8DD21	=	880
32156:	707DC921AE7DCB27	=	1012
32164:	CB27CB27A58F3001	=	777
32172:	24C97E7E66666666	=	897
32180:	7E7E101818181818	=	398
32188:	18187E7E6067E7E6	=	654
32196:	7E7E7E7E6067E7E6	=	787
32204:	7E7E60606C6C7E7E	=	918
32212:	0C0C7E7E607E7E06	=	630
32220:	7E7E7E7E607E7E60	=	954
32228:	7E7E7E7E06060606	=	528
32236:	06067E7E6067E7E6	=	720
32244:	7E7E7E7E6067E7E0	=	864
32252:	7E7F50A4FCB101FC	=	[illegible]
32260:	181FCB181FB15F42	=	651
32268:	3E18A2F64057C9CD	=	1051
32276:	FE7D06087E231214	=	592
32284:	10FAC92100402E18	=	[illegible]
32292:	AF47772310FC0C20	=	[illegible]
32300:	F9C0F1CD337E8F4E	=	[illegible]
32308:	2346237E23B7C8C5	=	[illegible]
32316:	E5CD8E7ECD137E81	=	[illegible]
32324:	[illegible]	=	[illegible]
32332:	[illegible]	=	[illegible]
32340:	[illegible]	=	[illegible]
32348:	[illegible]	=	[illegible]
32356:	[illegible]	=	[illegible]
32364:	[illegible]	=	[illegible]
32372:	[illegible]	=	[illegible]
32380:	[illegible]	=	[illegible]
32388:	[illegible]	=	[illegible]
32396:	[illegible]	=	[illegible]
32404:	[illegible]	=	[illegible]

■



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DEATH TRAP

Richard Hamer shows you how to get blown up by a Vic-20 with 16K expansion.

DEATH TRAP 20 is written for the Vic-20 with 16K expansion, and is similar to the arcade game Gridtrap, in which you control a man who has to defuse bombs before they explode.

Before loading or typing in the game, you must type

POKE 642,32:SYS64824

This is to make room for the user-defined graphics and extra screen memory.

Once loaded and run you will be presented with an options page which will, after a while, change to show the high scores.

Pressing 1 will print out sparse instructions — another key press will return you to the title page.

Pressing 2 allows you to redefine the movement keys — except the transporter key. You are asked, for example, Left? and you are expected to reply with your choice of key and Return.

The keys default to: I-Up; J-Down; D-Left; F-Right; f1-Pause; f1 again-Unpause; f5-Transport; f7 with Shift-Abort — The game ends, and the program returns to the title screen, without going through the high-score process.

Pressing 3 starts the game; pressing 4 alters the time decrease rate — 1 to 4; the lower the number, the faster the time goes down; pressing 5 alters the starting level — 1 to 15; 15 is hardest. If you start on a number, you work your way up through the levels from there.

The object of the game is to pass over the blocks and get to the bomb to defuse it in time, collecting flags for bonus points on the way. Coming into contact with a skull or the block hopper, will be fatal, as is letting the bomb explode. You have three lives. You can move off the side of the screen, and transport yourself out of a nasty situation. You cannot move over blank spaces but, unlike the arcade game, there is no "row scrolling". Defusing five bombs gets you onto the bonus screen.

In the bonus screen you must press space when you are above the flag. If you do so over a

(continued on next page)

```
0 POKE36879,25:PRINT"J":FORT=7168TO7647:READA:POKET,A:NEXT
1 O=1:V=0
10 DATA 55,255,255,255,255,255,255,255,,60,36,36,60,36,36,,,56,36,36,56,36,56,,,
60,32
20 DATA32,32,32,60,,,56,36,36,36,36,56,,,60,32,32,56,32,60,,,60,32,32,56,32,32,,
,60
30 DATA32,32,44,36,60,,,36,36,36,60,36,36,,,56,16,16,16,16,56,,,60,8,8,8,8,48,,,
36,40
40 DATA48,48,40,36,,,32,32,32,32,32,56,,,66,102,90,66,66,66,,,66,98,82,74,70,66,
,,60
50 DATA36,36,36,36,60,,,60,36,36,60,32,32,,,126,66,66,74,70,126,,,60,36,56,40,40
,36,,
60 DATA60,32,32,60,4,60,,,56,16,16,16,16,16,,,36,36,36,36,36,60,,,60,60,40,40,16
,16,,
70 DATA68,60,84,84,40,40,,,40,40,16,16,40,40,,,34,34,20,8,8,8,,,60,4,8,16,32,60,
,,1,3
80 DATA7,15,7,3,1,128,128,128,128,128,128,128,128,128,128,128,128,128,128,128,,6
3,80
90 DATA212,80,76,3,4,8,240,40,172,40,200,,128,72,,,,,,,,,7,8,10,8,8,11,72,39,,,,
,,,,
91 DATA224,16,80,16,16,208,10,228,17,15,3,3,3,3,2,12,136,240,192,192,192,192,64,
40,7,8
92 DATA10,16,17,20,19,8,224,16,80,8,136,40,200,16,196,243,15,3,3,12,240,192,35,2
07,240
93 DATA192,192,48,15,3,,,,,31,31,63,63,,,,,254,254,250,250,63,127,127,255,255,12
8,128
94 DATA255,244,244,232,232,208,80,96,224,3,4,2,1,7,31,63,63,196,56,,120,224,248,
252,252
95 DATA,60,36,36,36,36,60,,,0,24,8,8,8,28,,,60,4,4,60,32,60,,,60,4,4,28,4,60,,,3
2,40,40
```

```
0 POKE36879,25:PRINT"J":FORT=7168TO7647:READA:POKET,A:NEXT
1 O=1:V=0
10 DATA 55,255,255,255,255,255,255,255,,60,36,36,60,36,36,,,56,36,36,56,36,56,,,
60,32
20 DATA32,32,32,60,,,56,36,36,36,36,56,,,60,32,32,56,32,60,,,60,32,32,56,32,32,,
,60
30 DATA32,32,44,36,60,,,36,36,36,60,36,36,,,56,16,16,16,16,56,,,60,8,8,8,8,48,,,
36,40
4
```

```
0 POKE36879,25:PRINT"J":FORT=7168TO7647:READA:POKET,A:NEXT
1 O=1:V=0
10 DATA 55,255,255,255,255,255,255,255,,60,36,36,60,36,36,,,56,36,36,56,36,56,,,
60,32
20 DATA32,32,32,60,,,56,36,36,36,36,56,,,60,32,32,56,32,60,,,60,32,32,56,32,32,,
,60
30 DATA32,32,44,36,60,,,36,36,36,60,36,36,,,56,16,16,16,16,56,,,60,8,8,8,8,48,,,
36,40
40 DATA48,48,40,36,,,32,32,32,32,32,56,,,66,102,90,66,66,66,,,66,98,82,74,70,66,
,,60
50 DATA36,36,36,36,60,,,60,36,36,60,32,32,,,126,66,66,74,70,126,,,60,36,56,40,40
,36,,
60 DATA60,32,32,60,4,60,,,56,16,16,16,16,16,,,36,36,36,36,36,60,,,60,60,40,40,16
,16,,
70 DATA68,60,84,84,40,40,,,40,40,16,16,40,40,,,34,34,20,8,8,8,,,60,4,8,16,32,60,
,,1,3
80 DATA7,15,7,3,1,128,128,128,128,128,128,128,128,128,128,128,128,128,128,128,,6
3,80
```

(listing continued on next page)

(continued from previous page)

skull, you will die.

After pressing the space bar, you will glide down vertically. Lives lost here come off your overall number of lives. If you succeed in reaching the flag, you will receive a bonus, the value of which depends on what level you are on, and how quickly you reached the flag. At the end of all this, you return to the main game.

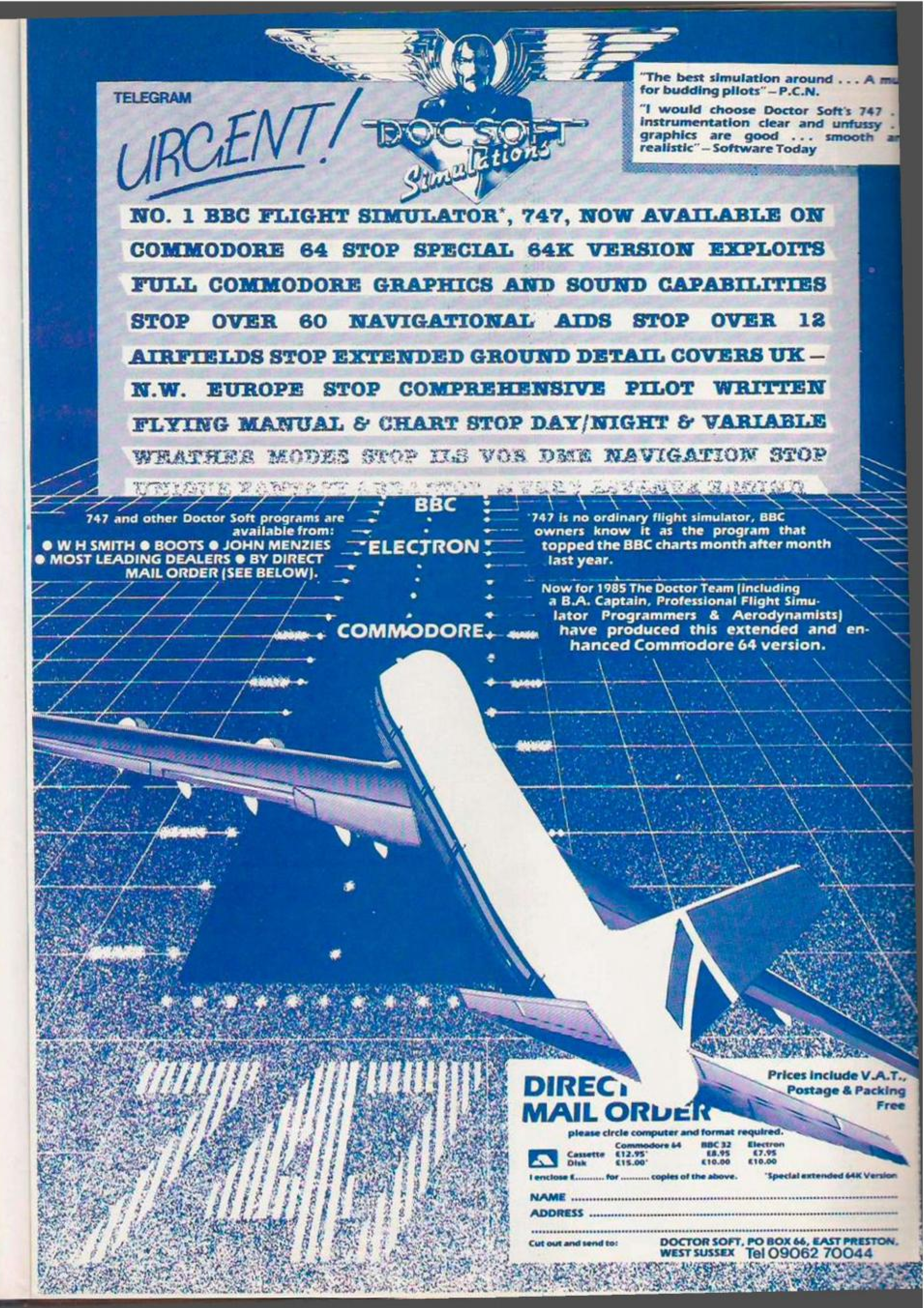
If you cannot/do not want to type in this game, but would like a copy of it, send £1.50 to 26 St. Barnabas Road, Emmer Green, Reading, Berkshire RG4 8RA. Please remember that the game requires 16K memory expansion.

One last point — the purple bar along the bottom of the screen represents the time left, while the red one underneath the score shows how much transporter power you have left — it is worth 100 points per unit left at the end of the level.

Also, flags are worth 250 points, bombs 500 points plus bonus, and each square "used" is worth 10 points. ■

(listing continued from previous page)

```
90 DATA212,80,76,3,4,8,240,40,172,40,200,,128,72,........7,8,10,8,8,11,72,39,...
....
91 DATA224,16,80,16,16,200,10,220,17,15,3,3,3,3,2,12,136,240,192,192,192,192,64,
40,7,8
92 DATA10,16,17,20,19,8,224,16,80,8,136,40,200,16,196,243,15,3,3,12,240,192,35,2
07,240
93 DATA192,192,48,15,3,....31,31,63,63,....254,254,250,250,63,127,127,255,255,12
8,128
94 DATA255,244,244,232,232,208,80,96,224,3,4,2,1,7,31,63,63,136,56,,128,224,240,
252,252
95 DATA,60,36,36,36,36,60,,,0,24,8,8,8,28,,,60,4,4,60,32,60,,,60,4,4,28,4,60,,,3
2,40,40
96 DATA60,8,8,,,60,32,32,60,4,60,,,60,32,32,60,36,60,,,60,4,4,8,8,8,,,60,36,36,6
0,36,60
97 DATA,,60,36,36,60,4,4,,63,63,63,63,63,31,15,7,252,252,252,252,252,248,240,224
98 FORT=0TO9:READHS(T),H$(T):NEXT:POKE36869,192
99 L$="D":R$="F":U$="I":D$="J":LL$="S":RR$="L"
100 POKE36866,PEEK(36866)AND128OR26:POKE36867,PEEK(36867)AND128OR66:POKE648,18:P
RINT"J"
101 POKE648,17:PRINT"J":POKE648,16:POKE36865,19:POKE36864,PEEK(36864)AND128OR8
102 POKE36869,192:PRINT"J"
110 DATA1000,DO,900,YOU,800,HATE,700,TYPING,600,IN,500,LONG,400,"PROGRAMS"",300,
I,200,"DO!"
120 DATA1,"G,ANDHI"
130 POKE37154,255
131 PRINT"█        █DEATHTRAP 20█":PRINTSPC(8)"█OPTIONS ":PRINTSPC(12)"█1█ INSTR
UCTIONS";
132 PRINTSPC(12)"█2█ DEFINE KEYS"SPC(13)"█3█ START GAME"SPC(14)"█4█ DECREASE RAT
E█Y.
133 PRINTSPC(8)"██5█ SKILL█"O"█ ":FORT=1TO500:GETA$:N=VAL(A$):IFN<1ORN>5THENNEXT
:GOTO130
134 ONNGOSUB140,160,190
135 IFN<>5THEN145
136 O=O+1:IFO>15THENO=1
137 GOTO131
140 POKE36869,207:PRINT"JGUIDE !█ OVER THE BLOCKS#+       $%               ,- )
141 PRINT"█TO DEFUSE THE BOMB./BEFORE                 :        THE TIME RUNS OUT
 AVOIDING";
142 PRINT"THE  SKULLS AND THE  BLOCKHOPPER"
143 FORT=1TO5000:GETA$:IFA$=""THENNEXT
144 POKE36869,192:RETURN
145 IFN<>4THEN100
146 V=V+1:IFV>4THENV=1
147 GOTO131
150 PRINT"J█        HIGH SCORES█"
151 POKE36864,12:POKE36865,30:POKE36866,22:POKE36867,46:FORT=0TO9:PRINTHS(T),H$(
T):NEXT
152 FORT=1TO1000:GETA$:IFA$=""THENNEXT
153 PRINT"J":GOTO100
160 A$="J█████████":PRINTA$"UP";:INPUTU$:PRINTA$"DOWN";:INPUTD$:PRINTA$"LEFT";:IN
PUTL$:PRINTA$"RIGHT";
161 INPUTR$
162 RETURN
190 POKE36869,207:POKE37139,0:POKE650,255
199 SC=0:ME=3:BT=25:SK=O+9:POKE36878,15:BF=0
200 POKE648,18:PRINT"J":POKE648,17:PRINT"J":POKE648,16:B=4148:BC=37940:XX=0:YY=0
:L=0:R=0
202 PRINT"J        █PLAY PLAYER 1":BD=0
209 H$="████████████████":PRINTH$"4"
210 FORM=0TO14:FORT=4148+M*52TO4172+M*52STEP2:POKET,42:NEXTT,M:PRINTH$"3"
211 FORM=0TO14:FORT=4149+M*52TO4173+M*52STEP2:POKET,43:NEXTT,M:PRINTH$"2"
215 FORM=0TO14:FORT=4174+M*52TO4198+M*52STEP2:POKET,44:NEXTT,M:PRINTH$"1"
220 FORM=0TO14:FORT=4175+M*52TO4199+M*52STEP2:POKET,45:NEXTT,M:PRINTH$"0"
230 FORT=37940TO38719:POKET,2:NEXT
231 PRINT"█
232 PRINT"██SCORE"0"  ,   ","████MEN 3"
233 FORT=4122TO4116+SK/2:POKE36876,240:POKET+33792,2:POKET,0:POKE36876,0:NEXT:G=
T-1
240 FORT=4928TO4963-SK:POKE36876,128:POKET,0:POKET+33792,4:POKE36876,0:NEXT
250 BT=35-SK:FORT=1TOSK:SX=INT(RND(1)*13):SY=INT(RND(1)*15):IFSX=0ANDSY=0THEN250
260 POKE36876,240:D=B+SY*52+SX*2:E=BC+SY*52+SX*2:POKEE,0:POKEE+1,0:POKEE+26,0:PO
KEE+27,0:POKED,38
270 POKED+1,39:POKED+26,40:POKED+27,41:POKE36876,0:NEXT:FORT=1TOINT(RND(1)*6)
280 SX=INT(RND(1)*13):SY=INT(RND(1)*15):IFSX=0ANDSY=0THEN280
290 POKE36876,220:D=B+SY*52+SX*2:E=BC+SY*52+SX*2:POKEE,2:POKEE+1,0:POKEE+27,0:PO
KED,27
300 POKED+1,28:POKED+26,32:POKED+27,29:POKE36876,0:NEXT
301 POKE36876,200:SX=INT(RND(1)*13):SY=INT(RND(1)*15):IFSX=0ANDSY=0THEN301
302 C=B+SY*52+SX*2:D=C+33792:POKED,0:POKED+1,0:POKED+26,0:POKED+27,0:POKEC,46
303 POKEC+1,47:POKEC+26,58:POKEC+27,59:POKE36876,0:HY=SY:HX=SX
305 IFBFTHEN331
310 SX=INT(RND(1)*13):SY=INT(RND(1)*15):IFSX*2+SY*52=YYOR(SX=HXANDSY=HY)THEN310
320 POKE36876,220:D=B+SY*52+SX*2:E=BC+SY*52+SX*2:POKEE,0:POKEE+1,0:POKEE+26,2:PO
KEE+27,2
330 POKED,30:POKED+1,31:POKED+26,44:POKED+27,45:BX=SX:BY=SY
331 J=XX+B:POKEJ,33:POKEJ+1,35:POKEJ+26,36:POKEJ+27,37:J=YY+B+33792:POKEJ,6:POKE
J+1,6
332 POKEJ+27,6:POKEJ+26,6
340 GH=R:POKE37154,255:GETA$:IFA$="█"THEN100
341 IF(YY-L*2)/52<>INT((YY-L*2)/52)THENL=(YY-((INT(YY/52))*52))/2
343 IFA$="█"ANDD>4121THENPOKED,32:O=O-1:GOSUB10000:R=L:GOTO470
350 IFA$<>"█"THEN370
360 GETA$:IFA$<>"█"THEN360
370 X=0:R=L:IFA$=L$OR((PEEK(37137)AND16)=0)THENR=R-1:X=-2
380 IFA$=U$OR((PEEK(37137)AND4)=0)THENX=-52
390 IFA$=D$OR((PEEK(37137)AND8)=0)THENX=52
400 POKE37154,127:IFA$=R$OR((PEEK(37152)AND128)=0)THENX=2:R=R+1
430 POKE36876,0
431 IFR<0THENX=24
432 IFR>12THENX=-24
450 B=4148:YY=YY+X:XY=PEEK(YY+B)
451 IFXY=30ORXY=38ORXY=42ORXY=27ORXY=46THEN456
452 YY=YY-X
455 R=GH:GOTO505
456 L=R:IFL<0THENL=12
457 IFL>12THENL=0
460 R=L:J=XX+B:POKEJ,32:POKEJ+1,32:POKEJ+26,32:POKEJ+27,32:XX=YY
470 J=YY+B:POKE198,0:BE=0:IFXY=30THENPOKEJ+26,36:POKEJ+27,37:POKEJ+33818,6:POKEJ
+33819,6:BE=1:GOTO1000
471 A$=""
480 IFXY=38THENPOKEJ,33:POKEJ+1,35:POKEJ+33792,6:POKEJ+33793,6:GOTO1000
490 SC=SC+10
491 J=YY+B:POKEJ,33:POKEJ+1,35:POKEJ+26,36:POKEJ+27,37:J=YY+B+33792:POKEJ,6:POKE
J+1,6:POKEJ+26,6
492 POKEJ+27,6
493 IFXY=27THENFORT=128TO253:POKE36876,T:NEXT:POKE36876,0:SC=SC+250
494 IFXY<>46THEN505
495 FORT=128TO253:POKE36876,T:NEXT:FORT=253TO127STEP-1:POKE36876,T:NEXT:SC=SC+50
0
496 FORT=BTTO0STEP-1:POKE36876,240:POKE4928+T,32:POKE36876,0:SC=SC+25:PRINT"████
██"SC:NEXT
497 M=36876:BD=BD+1:IFBD=5THEN2000
498 FORT=4928TO4963-SK:POKEM,128:POKET,0:SC=SC+(SK-9)*10:PRINT"██████"SC:POKET+3
3792,4:POKEM,0:NEXT
499 BT=35-SK:POKE36876,200:SX=INT(RND(1)*13):SY=INT(RND(1)*15):C=SX*2+SY*52
500 IFC=YYORC=BX*2+BY*52THEN499
501 HX=SX:HY=SY:C=B+C:D=C+33792:POKED,0:POKED+1,0:POKED+26,0:POKEE+27,0:POKEC,46
502 POKEC+1,47:POKEC+26,58:POKEC+27,59:POKE36876,0
505 F=1
506 PRINT"██████"SC"    ","█"ME
507 POKE4928+BT,32:BT=BT-1/V:IFBT<0THENGOSUB3000
600 Z=INT(RND(1)*4)
601 CX=BX:CY=BY:CX=CX-(Z=0)+(Z=1):CY=CY-(Z=2)+(Z=3):IFCX=13THENCX=0:GOTO603
602 IFCX<0THENCX=13
603 P=PEEK(B+CX*2+CY*52):IF(P<>33ANDP<>42)OR(CY<0ORCY>14)OR(CX=0ANDCY=0)THEN340
604 POKE36875,180:BB=BX*2+BY*52+B:POKEBB,42:POKEBB+1,43:POKEBB+33792,2:POKEBB+33
793,2:BX=CX:BY=CY
605 POKEBB+26,44:POKEBB+27,45:POKEBB+33818,2:POKEBB+33819,2
607 BB=BX*2+BY*52+B:BC=BB+33792:POKEBB,30:POKEBB+1,31:POKEBC,6:POKEBC+1,6:POKE36
875,0
608 IFF=33THEN1000
609 GOTO340
1000 ME=ME-1
1010 FORT=250TO126STEP-2:POKE36876,T:POKE36875,T:POKE36877,T:POKE36874,T:NEXT:IF
ME=0THEN8000
1020 IFPEEK(YY+B)=30THEN310
1050 GOTO331
2000 FORT=0TO4122STEP-1:POKET,32:SC=SC+100:PRINT"██████"SC:NEXT
2005 SK=SK+2:FORT=32TO1STEP-1:POKE36876,240:POKE36867,PEEK(36867)AND129OR(T*2):P
OKE36876,0
2006 SC=SC+50:PRINT"██████"SC
2010 FORM=1TO100:NEXTM,T:POKE648,18:PRINT"J":POKE648,17:PRINT"J":POKE648,16:PRIN
T"J              █BONUS SHEET"
2020 FORT=4876TO4900STEP2:POKET,38:NEXT
2030 FORT=4877TO4901STEP2:POKET,39:NEXT
2040 FORT=4902TO4926STEP2:POKET,40:NEXT
2050 FORT=4903TO4927STEP2:POKET,41:NEXT
2070 X=INT(RND(1)*13):II=4876+X*2:POKEII,27:POKEII+1,28:POKEII+26,32:POKEII+27,2
9:II=II+33792
2080 POKEII,2:POKEII+1,7:POKEII+27,7
2085 POKE36879,8
2090 FORT=1TO33:POKE36876,128:POKE36867,PEEK(36867)AND129OR(T*2):POKE36876,0:FOR
M=1TO100:NEXTM,T
2100 YY=0:PRINT"J     █HIT F1 TO START AND   SPACE TO DESCEND"
2110 GETA$:IFA$<>"█"THEN2110
2120 TI$="000000":A$="":L=0
2130 W=YY+B:POKEW,32:POKEW+1,32:POKEW+26,32:POKEW+27,32:YY=YY+2:L=L+1
2131 IFL>12THENL=0:YY=YY+26
2132 W=YY+B:P=PEEK(W):IFP=32THEN2140
2134 GOTO2500
2140 POKEW,33:POKEW+1,35:POKEW+26,36:POKEW+27,37
2150 GETA$:IFA$<>" "THEN2130
2160 POKEW,32:POKEW+1,32:POKEW+26,32:POKEW+27,32
2170 W=W+52:P=PEEK(W):IFP=32THEN2200
2190 GOTO2500
2200 POKEW,33:POKEW+1,35:POKEW+26,36:POKEW+27,37:GOTO2160
2500 FORT=32TO1STEP-1:POKE36876,240:POKE36867,PEEK(36867)AND129OR(T*2):POKE36876
,0
2510 FORM=1TO100:NEXTM,T:POKE648,18:PRINT"J":POKE648,17:PRINT"J":POKE648,16
2520 IFP=38THEN2600
2550 R1=VAL(TI$):POKE36879,25:PRINT"J          █WELL DONE":FORT=1TO1000:NEXT
2560 R1=30-R1:R1=R1*2*SK:PRINT"J          BONUS"R1:FORT=1TO1000:NEXT:SC=SC+R1:GOTO2
700
2600 ME=ME-1
2610 FORT=250TO126STEP-2:POKE36876,T:POKE36875,T:POKE36877,T:POKE36874,T:NEXT
2620 POKE36879,25:PRINT"J          █BAD LUCK":FORT=1TO1000:NEXT
2700 FORT=1TO33:POKE36876,128:POKE36867,PEEK(36867)AND129OR(T*2):POKE36876,0
2710 FORM=1TO100:NEXTM,T:PRINT"J":IFME=0THEN8000
2720 GOTO200
3000 GX=L:GY=INT(YY-L*2)/52
3001 HZ=HX*2+HY*52
3006 IFHX=GXANDHY=GYTHEN3500
3010 HZ=HZ+B:POKEHZ,32:POKEHZ+1,32:POKEHZ+26,32:POKEHZ+27,32
3011 IFHY<GYTHENHY=HY+1
3012 IFHX>GXTHENHX=HX-1
3013 IFHX<GXTHENHX=HX+1
3014 IFHY>GYTHENHY=HY-1
3015 HZ=HX*2+HY*52+B
3018 POKEHZ,46:POKEHZ+1,47
3020 POKEHZ+26,58:POKEHZ+27,59:HZ=HZ+33792:POKEHZ,0:POKEHZ+1,0:POKEHZ+26,0:POKEH
Z+27,0
3030 GOTO3001
3500 POKE36876,200:TX=INT(RND(1)*13):TY=INT(RND(1)*15):IFTX=GXANDTY=GYTHEN3500
3501 C=B+TY*52+TX*2:D=C+33792:POKED,0:POKED+1,0:POKED+26,0:POKED+27,0:POKEC,46
3502 POKEC+1,47:POKEC+26,58:POKEC+27,59:POKE36876,0:HY=TY:HX=TX:BT=35-SK
3510 FORT=4928TO4963-SK:POKE36876,128:POKET,0:POKET+33792,4:POKE36876,0:NEXT
3520 POKE36877,240:FORT=15TO0STEP-.5:POKE36878,T:POKE36864,PEEK(36864)AND128ORIN
T(RND(1)*10)+1
3523 POKE36865,INT(RND(1)*40)+10:NEXT:POKE36877,0:POKE36878,15:POKE36866,PEEK(36
866)AND128OR26
3525 POKE36864,PEEK(36864)AND128OR8
3530 POKE36865,19:HH=YY+B:POKEHH,33:POKEHH+1,35:POKEHH+26,36:POKEHH+27,37:HH=HH+
33792:POKEHH,6
3540 POKEHH+1,6:POKEHH+26,6:POKEHH+27,6
3550 ME=ME-1:IFME=0THEN8000
3560 RETURN
8000 PRINT"J":POKE36864,12:POKE36865,30:POKE36866,22:POKE36867,46:A$="█████":F
ORM=1TO3:FORT=1TO7
8001 POKE37154,255
8010 POKE36876,200:PRINTMID$(A$,T,1)"        GAME OVER":POKE36876,0:FORK=1TO10:NE
XTK,T,M
8020 PRINT"█":FORT=0TO20:POKE36876,200:PRINT"                      ":FORK=1TO10:POKE36
876,0:NEXTK,T
8040 PRINT"J":POKE36864,12:POKE36865,30:POKE36866,22:POKE36867,46:A$="█████":F
ORM=1TO3
8045 FORT=1TO7
8050 POKE36876,200:PRINTMID$(A$,T,1)"   SCORE"SC:POKE36876,0:FORK=1TO10:NEXTK,T,
M
8060 PRINT"█":FORT=0TO20:POKE36876,200:PRINT"                      ":FORK=1TO10:POK
E36876,0:NEXTK,T
8070 POKE36869,192:IFSC>HS(9)THENPRINT"J█WELL DONE!!!A HIGH    SCORER!!!"
8080 FORM=0TO9:IFSC>HS(M)THENPRINT"█YOUR RANKING IS"M+1:GOTO8100
8090 NEXT:GOTO100
8100 FORT=9TOM+1STEP-1:HS(T)=HS(T-1):H$(T)=H$(T-1):NEXT:HS(M)=SC:PRINT"██ENTER
YOUR NAME
8110 INPUTH$(T):IFLEN(H$(T))>10THENPRINT"MAX.10 CHARACTERS":GOTO8110
8120 GOTO150
10000 J=XX+B:POKEJ,32:POKEJ+1,32:POKEJ+26,32:POKEJ+27,32
10010 J=36874:FORT=128TO253:POKEJ,T:POKEJ+1,T:POKEJ+2,T:NEXT
10020 FORT=253TO127STEP-1:POKEJ,T:POKEJ+1,T:POKEJ+2,T:NEXT
10030 L=INT(RND(1)*13):K=INT(RND(1)*15):YY=L*2+K*52:XY=PEEK(YY+B):XX=YY:IFXY=46T
HEN10030
10035 R1=L:R=L:RETURN
```



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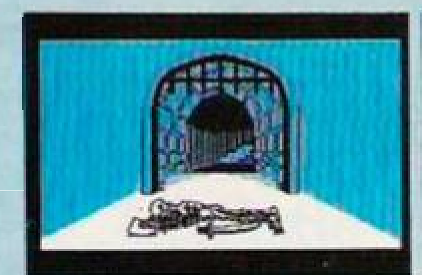
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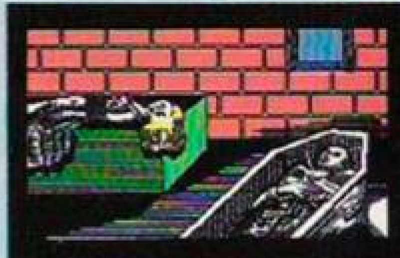
YC12b











Castle Of Terror is a suberb graphic adventure game set in the 1880's when and where "Dracula" stories abounded. You are in a village near a large Castle in which the secretive Count lives. You must travel about the village, collecting items which may be of use to you on your bold mission.

You must also find out what your mission is by talking to the right people. But don't be fooled!

★ Multi-word "English Language" style input
★ Superb, highly detailed graphics
★ Animated characters, special effects and sound.

Surviving is success enough, but escaping with the treasure is the ultimate achievement and won't be easily accomplished!

CASTLE·of·TERROR

Melbourne House

DOTMAN

Klaus Pederson presents a fast machine code version of an old arcade favourite.



DOTMAN IS A GAME for the Oric-1. It is written in machine-code and is therefore very fast. Unfortunately this also means that it is hard to type in, even though I have tried to make it simple with checksums, two programs to enter the code and strings instead of a lot of numbers separated by commas.

Dotman is a cute little fellow who must travel around the different mazes and eat dots.

The game contains different features like power dots, ghosts with double score — first ghost score 10 points, second score 20, third score 40 and the four ghost eaten scores 80 points. At every 1,000 points you gain an extra life — you start with three. If the telephone rings during a game, there is a pause button.

First type in the loader — if you are lazy don't, the game works without it. Save the loader with

CSAVE"PROLOAD"

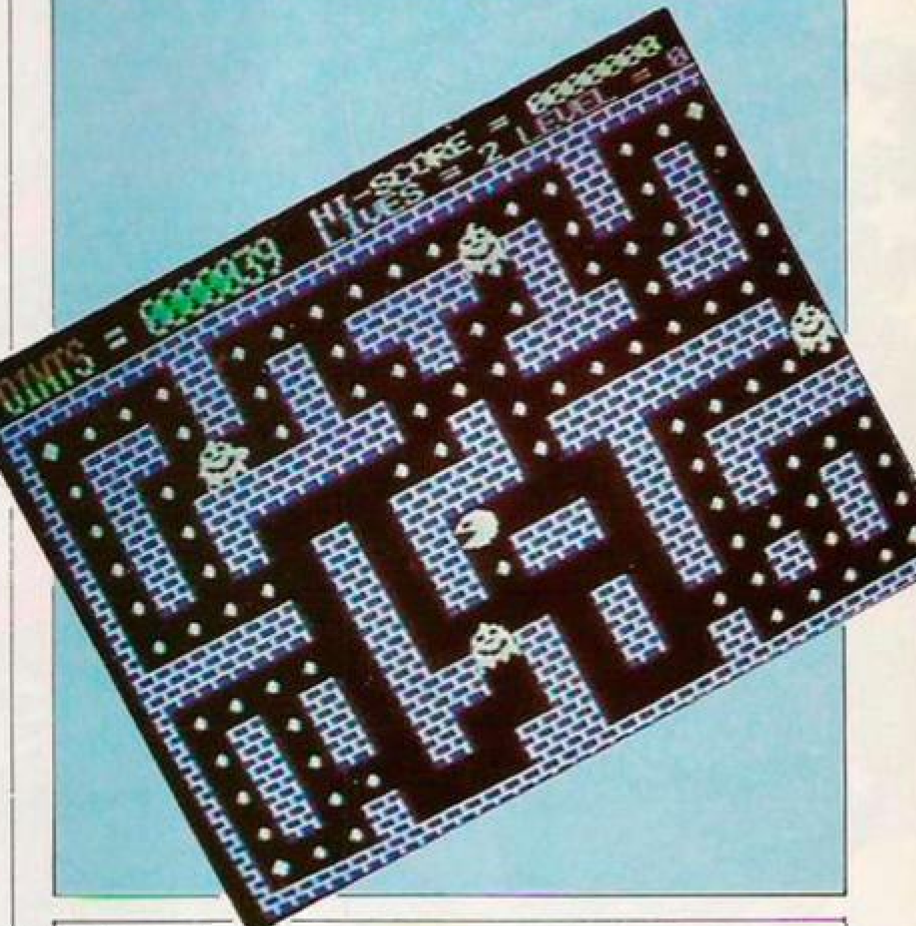
Then type in program 1. If you have confidence in yourself you can omit the checksum — lines 10, 20, 80, 110 and the lines 130-190.

Run the program and, if any errors should

(continued on page 100)

Loader program.

```
10 POKE#26A,10
20 CLS
30 PAPER0:INK6
40 GOSUB450
50 FORI=22TO26:PLOT1,I,9:NEXT
60 PLOT0,1,1:PLOT0,2,1
70 PRINT:PRINTSPC(11);CHR$(4);
80 PRINTCHR$(27);"NDOT-MAN";CHR$(4)
90 PRINT
100 PRINTSPC(6)"Welcome to Dotland."
110 PRINTSPC(5)"You as Dotman has to"
120 PRINTSPC(6)"clear the Dotmazes"
130 PRINTSPC(6)"for the  evil dots,"
140 PRINTSPC(3)"and eat the dotty ghosts"
150 PRINTSPC(5)"to get extra DotBonus
160 PRINT:PRINTSPC(11)CHR$(135)"SCORES
170 PRINTSPC(4)"Dots.........1 Point
180 PRINTSPC(4)"Power Dots...2 Points
190 FORI=0TO3
200 PRINTSPC(4)I+1"Ghost....."2^I*10"Points"
210 NEXT
215 REM TYPE POUND SIGN FOR "_" (UNDERLINE) CHARACTER
220 PRINT:PRINTSPC(8)CHR$(135)"CONTROL KEYS"
230 PRINTSPC(8)"P To Halt Game";CHR$(137)
240 PRINTSPC(8)"Cursor Keys To";CHR$(137)
250 PRINTSPC(8)"Control Dotman";CHR$(137)
260 PLOT4,24,CHR$(3)+"H_?T   "+CHR$(4)+"J]>\_"
270 PLOT4,25,CHR$(3)+"__W    "+CHR$(4)+"J?S;_"
280 PLOT4,26,CHR$(3)+"*__'   "+CHR$(4)+"J'O'O"
290 PLOT12,23,CHR$(4)+" X_]0"
300 PLOT30,26,CHR$(5)+"____"
310 FORI=19TO25:PLOT31,I,CHR$(5)+"__":NEXT
320 A$=CHR$(2)+CHR$(9)+"__________"
330 PLOT29,11,LEFT$(A$,6)
340 PLOT28,12,LEFT$(A$,8)+CHR$(16)
350 PLOT27,13,LEFT$(A$,10)
360 PLOT26,14,LEFT$(A$,12)+CHR$(16)
370 PLOT26,15,LEFT$(A$,12)+CHR$(16)
380 PLOT27,16,LEFT$(A$,10)
390 PLOT28,17,LEFT$(A$,8)
400 PLOT29,18,LEFT$(A$,6)
410 PLOT32,12,17:PLOT33,15,17
420 PLOT30,14,17
430 CLOAD"DOTMAN"
450 FORI=#400TO#44F:READA$:A=VAL("#"+A$):POKEI,A:NEXT
460 CALL#400
470 RETURN
480 DATA A2,6,A9,0,95,0,CA,10,FB,A9,B9,85,4,A6,5,B5
490 DATA 0,A8,BD,4A,4,AA,B9,46,4,A4,6,91,3,C8,CA,D0
500 DATA FA,84,6,A6,5,BD,4D,4,85,5,D0,E1,C0,0,D0,2
510 DATA E6,4,A2,FF,E8,B4,0,C8,98,29,3,95,0,F0,F5,A5
520 DATA 4,C9,BB,D0,C8,60,0,38,7,3F,3,2,3,1,2,0
```



Program 1.

```
10 DIM SUM(90)
20 FORI=0TO89:READSUM(I):NEXT
30 ADR=#4000
40 FORI=0TO89
50 READ A$
60 FORJ=1TO64STEP2
70 A=VAL("#"+MID$(A$,J,2))
80 OP=OP+A
90 POKEADR,A:ADR=ADR+1
100 NEXT:IFOP<>SUM(I)THENPRINT"ERROR IN "190+I*10:END
110 OP=0:NEXT
120 DATA 2750,3071,2665,3758,4241,3202,3885,3426,3355
```

(Listing continued on page 99)



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(Program 1 continued from page 97)

```
,3767,3737,4021,4207
 130 DATA 1641,178,77,77,82,167,211,451,1183,1008,937,
834,1027,1323,1502,593
 140 DATA170,190,508,1352,1652,1533,1194,1562,1006,159
0,2513,3283,1512,399
 150 DATA1569,3673,3097,3358,3649,3462,3240,3138,3498,
3126,2559,3034,4786
 160 DATA4755,2967,3323,2216,2726,2941,3387,3123,2429,
2552,4206,3509,3929
 170 DATA3319,3580,3334,2952,3265,3034,2902,2755,2869,
2617,3843,3378,4331
 180 DATA2731,3848,3164,3630,4194,3481,3756,3234
 190 DATA 20164BA90A8D6A02A900853785498548A937854E8552
20E240207E4120654120
 200 DATA 2E41202E4A209C4AA9008549854F203141A9D0853BA9
8D8539A9178540A90085
 210 DATA 008536855420204720654120 7E4120A940204F4720C3
40207C4AA64FE88651 20
 220 DATA B847C651D0F9202C48EAA554F01FC654A9518555A208
A90920CF4AA902A65520
 230 DATA CF4AA64ECAD0FDC655D0F0F005A64E20534858A5494A
AAA500DDAA41D008A649
 240 DATA 205C484C31484C4840ADDF02C9D0D00848209C4A2021
4A68C9879006C98C8002
 250 DATA 853660A536C988F00DC989F00CC98AF00EC98BF00760
4C73454CD8454C54464C
 260 DATA 1046A9008500A9858501A202A000B1008502 4A050291
00C8D0F4E601CAD0EFA0
 270 DATA 00A9878501A9088500A9908502A942850318B1029100
3009C8D0F7E601E603D0
 280 DATA F160A051B90844997FB888D0F760202241A649A9B885
01A9D08500BD00508502
 290 DATA BD01508503A000B102C977D00209B09100C05FD006A5
01C9BFF009C8D0E9E601
 300 DATA E603D0E360A6351004A2008635A000BD894399E086C8
E8C020D0F4B63560A204
 310 DATA A90A20CF4AA905A20120CF4AA648A000BD8841 99C086
E8C8C020D0F4E0E09002
 320 DATA A200864BA90420CF4A608BC8A8A8100000000000000
000000000000000010303
 330 DATA 0000000002030300100000000000000002000000000000
000000000000000030707
 340 DATA 000000000000202003000000000000000000000000000000
000000000000000000307
 350 DATA 0000000000000002007030000000000000002000000000000
0000000000000000000003
 360 DATA 0000000000000000007070300000000000020200000000000
0000000000000000000001
 370 DATA 0000000000000020030301000000000000303020000000
00000000000000000000
 380 DATA 0000000000000030010100000000000000383830000000
000000000000000000001
 390 DATA 0000000000000303801000000000000000038300000000000
00000000070F1F3F3F3F
 400 DATA 0000383C26273F3E3F3F1F1F0F0300003F3F3E3E3C30
00000000383C26273C30
 410 DATA 20303C3F3E380000000000070F19393F1F0000383C3E3F
3F3F0000070F19390F03
 420 DATA 01030F3F1F070000000000303C3E3E3F3F0000060F1F33
333F3F3F3F1F0F070000
 430 DATA 3F3F3E3E3C30000000000040C1E32333F000004060E0F
1F3F3F1F0F0E06040000
 440 DATA 3F33321E0C04000000000303C3E3E3F3F0000070F1F3F
3F3F3F33331F0F060000
 450 DATA 3F3F3E3E3C300000002F2F2F003D3D3D01030F09191F
3E3F373333833E3F3F2E24
 460 DATA 20303C24263E1F3F3B33071F3F3F3B113E3833373F3F
2E241F07333B3F3F3B11
 470 DATA 33331E0C0C0C0C00FF000000000000103070000000000
20303807030100000000
 480 DATA 003830200000000000000000000000000100000000000
00002001000000000000
 490 DATA 002000000000000000000000000000001030700000000000
20303807030100000000
 500 DATA 003830200000000000000000000103070F1F0000002030
383C3E1F0F0703010000
 510 DATA 003E3C38302000000000010A504F494E5453063D023030
303030303003084849 2D
 520 DATA 53434F5245203D20303030303030302020020A504F49
4E5453033D0230303030
 530 DATA 30303006084C4956455320 3D2033054C4556454C203D
20303120112020202020
 540 DATA 2020202020202020202020201020111504 0E47414D4520
4F5645522000803111020
 550 DATA 1115040E47414D45204F5645522000803111020111500
2050524553532041 4E7E
 560 DATA 20200311102011150120202020484 57E202020202003
11102011202020202020
 570 DATA 202020202020202020202010071431 2D3920544F205345
4C4543542053504 54544
 580 DATA 20302C203020544F20534545204C41427E5367686364
69686A64616263646165
 590 DATA 63666C686D6E6F706D6E7473727174737576202020 20
787A797B787A7C7D5859
 600 DATA 5A5BFFFDFE00F7000000FB0102040802040108080402
01020104080A01000000
 610 DATA 0100381000040A08009600000000001003810000 40A02
000000000000000000370A
 620 DATA 000000000032006400320100381010100A0804A44088
B1383025200B047B13830
 630 DATA 1EC95BF007C95FD011208048C640C64020C246E640E6
4020D34620C246C64018
 640 DATA A9F265374BA9444CA04685418642 18A50365028543A5
04690085 44A000B14191
 650 DATA 43A001B1419143A002B141A02B9143A003B141A02991
4360A440C8C8B13B3025
 660 DATA 20B047B13830 1EC95AF007C95ED01120B048E640E640
20C246C640C64020D346
 670 DATA 20C246E64018A9FA653748A9444CA046A54018 6950A8
B138302FC8B138302AC9
 680 DATA 59F007C95DD01420B04818A54048695085 4020C24668
854020D34620C24618A5
 690 DATA 38692085389002E63918A90A653748A9454CA04638A5
38E92885 45A539E90085
 700 DATA 46A440B145302EC8B145302948 20C24668C95BF007C9
5FD01420B04838A538E9
 710 DATA 5085 38B002C63920C24620D346A5458538A54685391 8
A902653748A9454CA046
 720 DATA 6900AA6820AA464CC946201E474CAA459D0004A90185
4B9D0404A9009D03044C
 730 DATA 6F47A912A2454CAA4618A537690429078537 60E600A5
54F00920944AA207C654
 740 DATA F004E654A207FE8A B8FEB2B8BD8ABBC93AD012A9309D
8ABB9DB2BBCAE004D003
 750 DATA 20A548D0E1A200E8BD8ABBDD9EBBF0F7900BA207BD8A
BB9D2744CAD0F76048A5
 760 DATA 388503A5398504A5408502686020DA4820EB4820FC48
200D49A90085 4AA213A0
 770 DATA 03B91E459D1304CA8810F6CA10F160A20F205F47 8A20
4B4938E905AA10F360BD
 780 DATA 00048502BD01048503BD02048504 60205F47A402B103
9D1404C8B1039D150420
 790 DATA B047B1039D170488B1039D1604 60B10308C9619007C9
77B000320830 6020186020
 800 DATA 5649A64ABD0404A0A54B39224585 4B6048981 86920A8
686020684AA64A209F47
 810 DATA AD76 02290FA8B92B452548D00588981890F1A64A9D04
04C901F01DC902F01FC9
 820 DATA 04F035C908F01D206F4718A54A6905C914D002A90085
4A60FE00044CE747DE00
 830 DATA 044CE74718BD01046928 9D0104BD02046900 9D02044C
E74738BD0104E9289D01
 840 DATA 04BD0204E9009D02044CE747A20F864C205F47BD0304
F005A904DE0304186916
 850 DATA 48A945690 0AA6820AA4538A54CE905AA10DC60A00088
D0FDCAD0F860E8E8E00A
 860 DATA D00AE64FA54F2903854FA20086492031412000484C77
48A201FECE8B8DCE8BC9
 870 DATA 3AD008A9309DCE8BCA10EE60CEC48B202C4820DC4AAD
C48BC930F00620 31414C
 880 DATA 31404CD949ADC48BC939F003EEC48B60A9648D03048D
08048D0D048D1204A00F
 890 DATA B90404AABD224549FF990404983 8E905A880EDA90185
4D4CD346A9B88D0204A9
 900 DATA F88D0104A905A2004C2046A9B88D0704A9F88D0604A9
23A2054C8046A9BF8D0C
 910 DATA 04A968 8D0B04A905A20A4C8046A9BF8D1104A9688D10
04A923A20F4C8046BD03
 920 DATA 04D009686868686868684C8C488A48200E4A68AAE00FF0
08E00AF00AE005F0094C
 930 DATA DA484C0D494CFC484CEB484818 6914A20420AA456860
A900854B205F47A402C8
 940 DATA C8208E47B070300E20B04720 8E47B0663004A901854B
A40288208E47B0503010
 950 DATA 20B047208E47B04E3006A902054B854BA40220B04720
B047208E47B039300EC8
 960 DATA 208E47B0313006A9008548854B38A503E92885 41A504
E9008542A402B1412090
 970 DATA 47B0133010C8B141209047B0093006A904054B854B60
4C1E49A0008400A200A9
 980 DATA 138501BD59449943BDC8E8C601D0F418A50069288500
A8C0F0D0E4A200205348
 990 DATA 202E4A4C2840AD0802C938D0F960A44D8453208C4AA2
0620E646C653D0F7264D
 1000 DATA 60A9008DDF02ADDF02297FF0F960A226BDC8449DD1B
BCA10F7A5528DE7BB2021
 1010 DATA 4AC930D008A649205C484C2E4A9012C93AB00E85522
90F2A2A1869052A854ED0
 1020 DATA CDA9008549 4C2E41A20F205F478A8550205649A5503
8E905AA10EF60A20F205F
 1030 DATA 47206F478A38E905AA10F360A20020AF4A4CBE4AA20
E20AF4A4CBE4AA00DA900
 1040 DATA 9950048810FAA9388D570420BE4A60A000BD3B45995
004E8C8C00ED0F460A250
 1050 DATA A004AD00D0C9A6D0034C6CFA4C86FAAC00D0C0A6D00
34C35F54C90F5A9008557
 1060 DATA A21C20AF4A20BE4AA906A2142053 48A65720CF4AE65
7A557C920D0EC209C4A60
 1070 DATA A22A20AF4A20BE4AA90385 58A2002053 48C658D0F76
0AD00D0C9A6D00620A9E9
 1080 DATA 4C7FF92021EC4CC9F95555555555555555555555555555
5555555555555555555555
```

(continued from page 97)

occur, correct them and rerun the program. Save it with:

CSAVE"PROG1"

Now type in program 2. It is not necessary to enter all the mazes — just alter the number in line 15. If you like, you can also make your own mazes — max 10-11. Then save it with:

CSAVE"PROG2"

When you have typed in all the programs and found no errors, you can start mixing them using this method:

Find a new tape and rewind it to start. Load the loader — if it is typed in — save it on the new tape:

CSAVE"LOADER",AUTO

Then clear the memory with New. Load program 1 and run it, then load program 2, run it. When it stops, it will print how to save the final program.

To start the game, enter skill level and press any key except keys 1 and 0. If you press 0, you will see the mazes.

Then you are to guide Dotman around the mazes and eat all the dots. But — beware of the evil ghosts. If you get too close to one of them, they will eat you alive. Of course, you can defend yourself by eating a power dot. By eating one of these the ghosts become angry but harmless and then you can eat them.

If you send £3.50 to me, I can supply you with a copy on tape of Maxi-Dotman. Just send to: Klaus Pedersen, Sondervej 9, Gundsomagle, DK-4000 Roskilde, Denmark.

The underline should be read as a £.

■

Program 2.

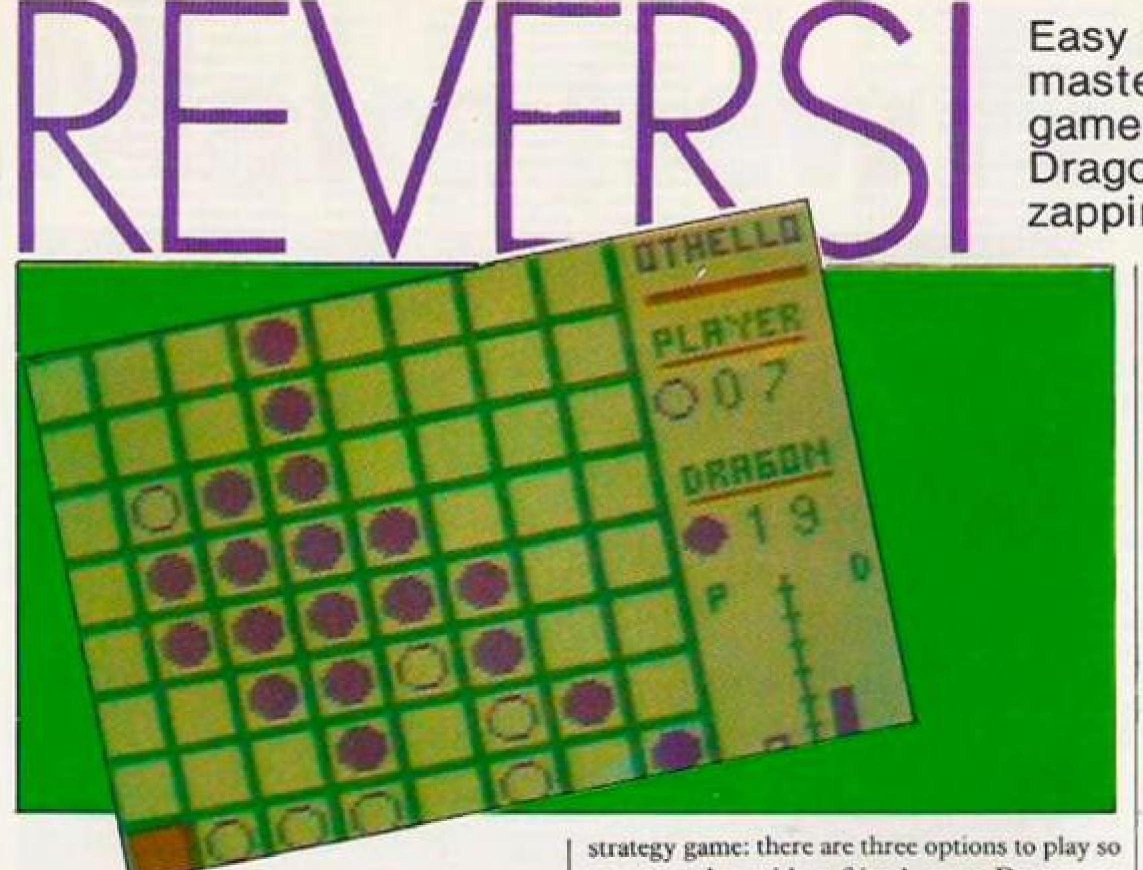
```
 5 CLS
 10 ANT=5:LOOK=#5000
 20 ADR=LOOK+ANT*2
 30 POKE#485F,ANT*2
 40 FOR NR=1TOANT
 50 DOKE LOOK,ADR
 60 LOOK=LOOK+2:DOT=4
 70 FOR I=0TO25
 80 READ PA,IN,LA$
 82 POKE ADR,PA
 84 POKE ADR+1,IN
 90 FOR P=2TO39
 100 A=ASC(MID$(LA$,P-1,1))
 110 IFA=88THENDOT=DOT+1ELSEIFA=92THENDOT=DOT+2
 120 POKEADR+P,A:NEXT
 130 ADR=ADR+40:NEXT
 140 DOKE#41A9+NR,DOT:NEXT
 150 PRINT"NOW TYPE :"
 160 PRINT"CSAVE";CHR$(34);"DOTMAN";CHR$(34);",A#4000,
E";HEX$(ADR);",AUTO"
 165 END
 170 REM      **** FIRST MAZE ****
 171 REM TYPE POUND SIGN FOR "_" CHARACTER
 180 DATA 0,3,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww
 190 DATA 0,3,w\]xzXYXYwwXYXYXYXYXYXYXYXYXYwwXYxz\]w
 200 DATA 0,3,w^_y(Z[Z[wwZ[Z[Z[Z[Z[Z[Z[Z[Z[wwZ[y(^_w
 210 DATA 0,3,wXYwwwwXYwwXYwwXYwwwwwwXYwwXYwwXYwwXYw
 220 DATA 0,3,wZ[wwwwZ[wwZ[wwZ[wwwwwwZ[wwZ[wwZ[wwZ[w
 230 DATA 0,3,wXYwwXYXYXYXYwwXYXYwwXYXYwwXYXYXYwwXYw
 240 DATA 0,3,wZ[wwZ[Z[Z[Z[wwZ[Z[wwZ[Z[wwZ[Z[Z[wwZ[w
 250 DATA 0,3,wXYwwXYwwwwwwwwwwXYXYXYwwwwwwXYwwwwXYw
 260 DATA 0,3,wZ[wwZ[wwwwwwwwwwZ[Z[Z[wwwwwwZ[wwwwZ[w
 270 DATA 0,3,wXYwwXYwwXYXYXYXYwwXYXYXYXYXYXYXYXYXYw
 280 DATA 0,3,wZ[wwZ[wwZ[Z[Z[Z[wwZ[Z[Z[Z[Z[Z[Z[Z[Z[w
 290 DATA 0,3,wXYXYXYXYwwXYwwwwXYwwwwwwwwwwwwwwwwXYw
 300 DATA 0,3,wZ[Z[Z[Z[wwZ[wwwwZ[wwwwwwwwwwwwwwwwZ[w
 310 DATA 0,3,wwwwwwwwwXYwwXYwwXYXYghXYwwXYXYXYXYXYw
 320 DATA 0,3,wwwwwwwwwZ[wwZ[wwZ[Z[cdZ[wwZ[Z[Z[Z[Z[w
 330 DATA 0,3,wXYXYXYXYwwXYwwXYwwwwXYwwXYwwwwwwwwwww
 340 DATA 0,3,wZ[Z[Z[Z[wwZ[wwZ[wwwwZ[wwZ[wwwwwwwwwww
 350 DATA 0,3,wXYwwXYwwXYwwXYXYXYXYXYXYwwXYwwXYXYXYw
 360 DATA 0,3,wZ[wwZ[wwZ[wwZ[Z[Z[Z[Z[Z[wwZ[wwZ[Z[Z[w
 370 DATA 0,3,wXYwwXYwwXYwwwwXYwwXYwwXYwwXYXYXYwwXYw
 380 DATA 0,3,wZ[wwZ[wwZ[wwwwZ[wwZ[wwZ[wwZ[Z[Z[wwZ[w
 390 DATA 0,3,wXYwwXYXYXYwwXYXYwwXYwwXYXYXYwwXYwwXYw
 400 DATA 0,3,wZ[wwZ[Z[Z[wwZ[Z[wwZ[wwZ[Z[Z[wwZ[wwZ[w
 410 DATA 0,3,w\]xzXYwwXYXYXYwwwwXYXYXYwwXYXYXYxz\]w
 420 DATA 0,3,w^_y(Z[wwZ[Z[Z[wwwwZ[Z[Z[wwZ[Z[Z[y(^_w
 430 DATA 0,3,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww
 440 REM      **** 2. MAZE ****
 450 DATA 0,3,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww
 460 DATA 0,3,w\]xzXYXYXYwwXYXYXYXYXYwwXYXYXYXYxz\]w
 470 DATA 0,3,w^_y(Z[Z[Z[wwZ[Z[Z[Z[Z[wwZ[Z[Z[Z[y(^_w
 480 DATA 0,3,wXYwwwwwwXYwwXYwwwwwwXYwwXYwwXYwwwwXYw
 490 DATA 0,3,wZ[wwwwwwZ[wwZ[wwwwwwZ[wwZ[wwZ[wwwwZ[w
 500 DATA 0,3,wXYXYXYXYXYwwXYXYXYXYXYXYXYwwXYXYwwXYw
 510 DATA 0,3,wZ[Z[Z[Z[Z[wwZ[Z[Z[Z[Z[Z[Z[wwZ[Z[wwZ[w
 520 DATA 0,3,wwwwwwwwwXYwwXYwwwwwwXYwwwwwwwwXYwwXYw
 530 DATA 0,3,wwwwwwwwwZ[wwZ[wwwwwwZ[wwwwwwwwZ[wwZ[w
 540 DATA 0,3,wXYXYXYwwXYXYXYwwXYXYXYwwXYXYXYXYXYXYw
 550 DATA 0,3,wZ[Z[Z[wwZ[Z[Z[wwZ[Z[Z[wwZ[Z[Z[Z[Z[Z[w
 560 DATA 0,3,wXYwwXYwwXYwwXYwwXYwwwwwwXYwwwwwwwwXYw
 570 DATA 0,3,wZ[wwZ[wwZ[wwZ[wwZ[wwwwwwZ[wwwwwwwwZ[w
 580 DATA 0,3,wXYwwXYwwXYwwXYXYXYwwabXYXYXYXYXYXYXYw
 590 DATA 0,3,wZ[wwZ[wwZ[wwZ[Z[Z[wwcdZ[Z[Z[Z[Z[Z[Z[w
 600 DATA 0,3,wXYXYXYXYwwXYwwwwwwXYwwXYwwXYwwwwwwwww
 610 DATA 0,3,wZ[Z[Z[Z[wwZ[wwwwwwZ[wwZ[wwZ[wwwwwwwww
 620 DATA 0,3,wwwwwwwXYwwwwXYwwXYXYXYwwXYwwXYXYXYwww
 630 DATA 0,3,wwwwwwwZ[wwwwZ[wwZ[Z[Z[wwZ[wwZ[Z[Z[www
 640 DATA 0,3,wXYXYXYXYXYXYXYXYXYwwXYXYXYwwXYwwXYXYw
 650 DATA 0,3,wZ[Z[Z[Z[Z[Z[Z[Z[Z[wwZ[Z[Z[wwZ[wwZ[Z[w
 660 DATA 0,3,wXYwwXYwwXYwwwwwwXYwwXYwwwwwwXYwwwwXYw
 670 DATA 0,3,wZ[wwZ[wwZ[wwwwwwZ[wwZ[wwwwwwZ[wwwwZ[w
 680 DATA 0,3,w\]xzXYwwXYXYXYXYXYwwXYXYXYXYXYXYxz\]w
 690 DATA 0,3,w^_y(Z[wwZ[Z[Z[Z[Z[wwZ[Z[Z[Z[Z[Z[y(^_w
 700 DATA 0,3,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww
 710 REM      **** 3. MAZE ****
 720 DATA 0,3,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww
 730 DATA 0,3,w\]xzXYXYXYwwXYXYXYXYwwXYXYXYwwXYxz\]w
 740 DATA 0,3,w^_y(Z[Z[Z[wwZ[Z[Z[Z[wwZ[Z[Z[wwZ[y(^_w
 750 DATA 0,3,wXYwwwwwwXYwwXYwwwwXYwwXYwwXYwwXYwwXYw
 760 DATA 0,3,wZ[wwwwwwZ[wwZ[wwwwZ[wwZ[wwZ[wwZ[wwZ[w
 770 DATA 0,3,wXYwwXYXYXYXYXYwwXYXYXYXYwwXYXYXYwwXYw
 780 DATA 0,3,wZ[wwZ[Z[Z[Z[Z[wwZ[Z[Z[Z[wwZ[Z[Z[wwZ[w
 790 DATA 0,3,wXYwwXYwwwwXYwwwwXYwwXYwwwwwwwwXYwwXYw
 800 DATA 0,3,wZ[wwZ[wwwwZ[wwwwZ[wwZ[wwwwwwwwZ[wwZ[w
 810 DATA 0,3,wXYwwXYXYXYXYXYwwXYwwXYwwXYXYXYXYXYXYw
 820 DATA 0,3,wZ[wwZ[Z[Z[Z[Z[wwZ[wwZ[wwZ[Z[Z[Z[Z[Z[w
 830 DATA 0,3,wXYwwwwwwXYwwXYXYXYXYwwXYwwXYwwwwwwXYw
 840 DATA 0,3,wZ[wwwwwwZ[wwZ[Z[Z[Z[wwZ[wwZ[wwwwwwZ[w
 850 DATA 0,3,wXYXYXYwwXYwwwwXYwwwwabwwXYwwXYwwXYXYw
 860 DATA 0,3,wZ[Z[Z[wwZ[wwwwZ[wwwwcdwwZ[wwZ[wwZ[Z[w
 870 DATA 0,3,wwwwwXYwwXYXYXYXYXYwwXYXYXYXYXYwwXYwww
 880 DATA 0,3,wwwwwZ[wwZ[Z[Z[Z[Z[wwZ[Z[Z[Z[Z[wwZ[www
 890 DATA 0,3,wXYXYXYXYwwXYwwXYwwXYwwwwwwwwwwwwXYXYw
 900 DATA 0,3,wZ[Z[Z[Z[wwZ[wwZ[wwZ[wwwwwwwwwwwwZ[Z[w
 910 DATA 0,3,wXYwwXYwwXYwwXYwwXYwwXYwwXYXYXYwwwwXYw
 920 DATA 0,3,wZ[wwZ[wwZ[wwZ[wwZ[wwZ[wwZ[Z[Z[wwwwZ[w
 930 DATA 0,3,wXYwwXYwwXYwwXYwwXYwwXYwwXYwwXYXYwwXYw
 940 DATA 0,3,wZ[wwZ[wwZ[wwZ[wwZ[wwZ[wwZ[wwZ[Z[wwZ[w
 950 DATA 0,3,w\]xzXYXYXYXYXYXYXYwwXYXYXYwwwwXYxz\]w
 960 DATA 0,3,w^_y(Z[Z[Z[Z[Z[Z[Z[wwZ[Z[Z[wwwwZ[y(^_w
 970 DATA 0,3,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww
 980 REM      **** 4. MAZE ****
 990 DATA 0,3,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww
 1000 DATA 0,3,w\]xzXYXYXYwwXYXYXYXYXYXYwwXYXYXYxz\]w
 1010 DATA 0,3,w^_y(Z[Z[Z[wwZ[Z[Z[Z[Z[Z[wwZ[Z[Z[y(^_w
 1020 DATA 0,3,wXYwwXYwwXYwwXYwwwwXYwwXYwwXYwwXYwwXYw
 1030 DATA 0,3,wZ[wwZ[wwZ[wwZ[wwwwZ[wwZ[wwZ[wwZ[wwZ[w
 1040 DATA 0,3,wXYXYXYXYXYXYXYXYXYwwXYXYXYwwXYXYXYXYw
 1050 DATA 0,3,wZ[Z[Z[Z[Z[Z[Z[Z[Z[wwZ[Z[Z[wwZ[Z[Z[Z[w
 1060 DATA 0,3,wwwwwwwwwXYwwwwXYwwwwwwXYwwwwwwXYwwXYw
 1070 DATA 0,3,wwwwwwwwwZ[wwwwZ[wwwwwwZ[wwwwwwZ[wwZ[w
 1080 DATA 0,3,wXYXYXYXYXYwwXYXYXYXYXYXYwwXYXYXYwwXYw
 1090 DATA 0,3,wZ[Z[Z[Z[Z[wwZ[Z[Z[Z[Z[Z[wwZ[Z[Z[wwZ[w
 1100 DATA 0,3,wXYwwwwwwwwwwXYwwwwwwXYwwwwXYwwXYXYXYw
 1110 DATA 0,3,wZ[wwwwwwwwwwZ[wwwwwwZ[wwwwZ[wwZ[Z[Z[w
 1120 DATA 0,3,wXYXYXYXYXYXYXYwwXYXYabXYXYXYwwwwwwXYw
 1130 DATA 0,3,wZ[Z[Z[Z[Z[Z[Z[wwZ[Z[cdZ[Z[Z[wwwwwwZ[w
 1140 DATA 0,3,wXYwwXYwwwwwwXYXYXYwwXYwwwwwwwwwwXYXYw
 1150 DATA 0,3,wZ[wwZ[wwwwwwZ[Z[Z[wwZ[wwwwwwwwwwZ[Z[w
 1160 DATA 0,3,wXYwwXYwwXYXYXYwwXYwwXYwwXYXYXYwwXYwww
 1170 DATA 0,3,wZ[wwZ[wwZ[Z[Z[wwZ[wwZ[wwZ[Z[Z[wwZ[www
 1180 DATA 0,3,wXYXYXYwwXYwwXYwwXYwwXYXYXYwwXYXYXYXYXYw
 1190 DATA 0,3,wZ[Z[Z[wwZ[wwZ[wwZ[wwZ[Z[Z[wwZ[Z[Z[Z[Z[w
 1200 DATA 0,3,wXYwwXYwwXYwwXYwwXYwwwwwwwwwwwwwwwwXYw
 1210 DATA 0,3,wZ[wwZ[wwZ[wwZ[wwZ[wwwwwwwwwwwwwwwwZ[w
 1220 DATA 0,3,w\]xzXYXYXYXYwwXYXYXYXYXYXYXYXYXYxz\]w
 1230 DATA 0,3,w^_y(Z[Z[Z[Z[wwZ[Z[Z[Z[Z[Z[Z[Z[Z[y(^_w
 1240 DATA 0,3,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww
 1250 REM      **** 5. MAZE ****
 1260 DATA 0,3,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww
 1270 DATA 0,3,w\]xzXYXYXYXYXYXYXYXYXYXYXYXYXYXYxz\]w
 1280 DATA 0,3,w^_y(Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[y(^_w
 1290 DATA 0,3,wXYwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwXYw
 1300 DATA 0,3,wZ[wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwZ[w
 1310 DATA 0,3,wXYwwXYXYXYXYXYXYXYXYXYXYXYXYXYXYwwXYw
 1320 DATA 0,3,wZ[wwZ[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[wwZ[w
 1330 DATA 0,3,wXYwwXYwwXYwwwwwwwwwwwwwwwwwwwwXYwwXYw
 1340 DATA 0,3,wZ[wwZ[wwZ[wwwwwwwwwwwwwwwwwwwwZ[wwZ[w
 1350 DATA 0,3,wXYwwXYwwXYXYXYXYXYXYXYXYXYXYwwXYwwXYw
 1360 DATA 0,3,wZ[wwZ[wwZ[Z[Z[Z[Z[Z[Z[Z[Z[Z[wwZ[wwZ[w
 1370 DATA 0,3,wXYwwXYwwXYwwwwXYwwwwXYwwwwXYwwXYwwXYw
 1380 DATA 0,3,wZ[wwZ[wwZ[wwwwZ[wwwwZ[wwwwZ[wwZ[wwZ[w
 1390 DATA 0,3,wXYwwXYwwXYwwwwXYwwwwghwwwwXYwwXYwwXYw
 1400 DATA 0,3,wZ[wwZ[wwZ[wwwwZ[wwwwcdwwwwZ[wwZ[wwZ[w
 1410 DATA 0,3,wXYwwXYwwXYXYXYXYXYXYXYXYXYXYwwXYwwXYw
 1420 DATA 0,3,wZ[wwZ[wwZ[Z[Z[Z[Z[Z[Z[Z[Z[Z[wwZ[wwZ[w
 1430 DATA 0,3,wXYwwXYwwwwwwwwwwwwwwwwwwwwwwwwXYwwXYw
 1440 DATA 0,3,wZ[wwZ[wwwwwwwwwwwwwwwwwwwwwwwwZ[wwZ[w
 1450 DATA 0,3,wXYwwXYXYXYXYXYXYXYXYXYXYXYXYXYXYwwXYw
 1460 DATA 0,3,wZ[wwZ[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[wwZ[w
 1470 DATA 0,3,wXYwwwwwwwwwwwwwwwwwwwwwwwwwwwwXYwwXYw
 1480 DATA 0,3,wZ[wwwwwwwwwwwwwwwwwwwwwwwwwwwwZ[wwZ[w
 1490 DATA 0,3,w\]xzXYXYXYXYXYXYXYXYXYXYXYXYXYXYxz\]w
 1500 DATA 0,3,w^_y(Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[Z[y(^_w
 1510 DATA 0,3,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww
```

Hex dump.

```
4608 : B8224F3154345632 = 618
4616 : 3546563135465631 = 516
4624 : 3046563235415631 = 507
4632 : 3541563130414F32 = 495
4640 : 5632354356313543 = 511
4648 : 5631304356323546 = 509
4656 : 5631354656313046 = 511
4664 : 5635465632462200 = 449
4672 : ECECE4E4ECE40000 = 1392
4680 : 0000000000000000 = 0
4688 : 0A0105040405010A = 40
4696 : 0001000203030200 = 11
4704 : 0100050206050506 = 30
4712 : 0205000403050000 = 19
4720 : 0503040004030500 = 24
4728 : 0005030400050206 = 25
4736 : 0505060205000100 = 24
4744 : 020303020001000A = 21
4752 : 0105040405010A02 = 32
4760 : 0201000000010202 = 8
4768 : 02E640AA01420081 = 662
4776 : 4000021400021400 = 282
4784 : 2140002142008140 = 397
4792 : AA0140AA0142AA81 = 771
4800 : 4AAAA14AAAA14AAA = 1054
4808 : A14AAAA142AA8140 = 995
4816 : AA017E1A617E18C0 = 762
4824 : 7E1BDC7E19053939 = 643
4832 : 397E18357E16E67E = 764
4840 : 16727E1BE97E1D92 = 823
4848 : 7E1CC680F1E3D380 = 1287
4856 : 9383F3E2D2808082 = 1343
4864 : F3E3D3C292808080 = 1405
4872 : D2808080F1E3D380 = 1401
4880 : 8080FA8080CA8085 = 1225
4888 : 8080DBC3930AFBC3 = 1433
4896 : 80809A808080DA80 = 1140
4904 : 8080FA8080CA8080 = 1220
4912 : FA8080CA80858080 = 1225
4920 : DA80808AFA808080 = 1246
4928 : 9A808080DA808080 = 1140
4936 : FA8080CA8080F4EC = 1444
4944 : DC8080D480808080 = 1200
4952 : 8080FCECDCC89C8C = 1460
4960 : FCEBDCCC9C80F4EC = 1680
4968 : DC808080224F3256 = 909
4976 : 3235454546474746 = 523
4984 : 4544434344454443 = 543
4992 : 43220000DF202020 = 428
5000 : 43292020544F4D20 = 444
5008 : 2046494552532020 = 473
5016 : 31393834202000DF = 501
5024 : 534F5252592C5351 = 623
5032 : 5541524520414C52 = 556
5040 : 45414459204F4343 = 536
5048 : 555049454400D053 = 679
5056 : 4F5252592C544841 = 597
5064 : 5420444F45534E27 = 532
5072 : 5420464C414E4820 = 512
5080 : 4120524F5700594F = 513
5088 : 55275245204E4F54 = 548
5096 : 204E4550054205 44F = 546
5104 : 204D59205049 4543 = 519
5112 : 45530000D5505245 = 596
5120 : 535320414E592048 = 537
5128 : 4559205 44F205345 = 537
5136 : 4520424F41524400 = 461
5144 : 3749204841564520 = 484
5152 : 544F20464F524641 = 561
5160 : 4954204D59204D4F = 543
5168 : 5645003737373750 = 455
5176 : 5245535320454E54 = 580
5184 : 455220544F20504C = 534
5192 : 41590059 7E1CAE59 = 660
5200 : 4F55204841564520 = 520
5208 : 2020205049454345 = 454
5216 : 532C492048415645 = 524
5224 : 0037534F5252592C = 514
5232 : 4920574F4E205448 = 537
5240 : 4154204F4E450037 = 462
5248 : 412054494500594F = 491
5256 : 5520574F4E005448 = 517
5264 : 4154205741532041 = 513
5272 : 0050455246454354 = 521
5280 : 20474140450007 57 = 480
5288 : 414C484157415900 = 522
5296 : 46494740542E2E2E = 508
5304 : 00404F542047414D = 480
5312 : 4500564552592043 = 494
5320 : 4C4F53452047414D = 552
5328 : 4500144141414141 = 414
5336 : 1404140404040404 = 64
5344 : 1441010410405514 = 275
5352 : 4101140141140410 = 192
5360 : 4044550404554054 = 458
5368 : 0101411414414054 = 320
5376 : 4141145501010410 = 257
5384 : 4040144141144141 = 420
5392 : 1414414115014114 = 277
5400 : 444F20594F552057 = 551
5408 : 414E5420544F2047 = 525
5416 : 4F20464952535420 = 535
5424 : 20592F4E29001212 = 331
5432 : 1280 15E28D1F378D = 918
5440 : 8A778E040006CFA7 = 959
5448 : 8901A0A78901E0A7 = 994
5456 : 8900A0A7808C0420 = 768
5464 : 25EDA784A709001F = 900
5472 : 3009002 00C060025 = 400
5480 : F14F100E12F30E04 = 805
5488 : 21EEA1EF014C010F = 1020
5496 : 25F7308900024F8C = 690
5504 : 04A125ED8E05C38F = 972
5512 : 00000E13048D90E5 = 991
5520 : 7E1F518F00000E15 = 728
5528 : 178D90E58D80E527 = 1229
5536 : 058776 1A20738D1F = 699
5544 : 091212121212120E = 259
5552 : 04225FA68481F025 = 837
5560 : 0480302000208 10A7 = 536
5568 : 805CC11C25ED3089 = 900
5576 : 00040C04A225E320 = 606
5584 : C80E0600100E2A00 = 551
5592 : EC81EDA18C120025 = 958
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```

REVERSI

Easy to learn but hard to master, Reversi is a board game implemented on the Dragon. A change from all that zapping.



IS YOUR Dragon overheated? Tired of zapping nasty aliens into hyper-space? Are your nerves breaking? Here is the solution: Reversi, a game to relax and to test your brains instead of the strength of your joystick.

Reversi is a computerised version of an old Chinese board game. The program offers almost every feature you would expect in a strategy game: there are three options to play so you can play with a friend, your Dragon or leave it playing on its own. I included three difficulty levels, the third one being the toughest. The program will warn you and tell you what you did wrong if you made a mistake — so cheating is almost impossible.

Using Takeback you can re-run your last move. With Change you can give your positions to the computer and take over his game. Not fair but quite satisfying if you can't stand to lose.

Full instructions are included in the program so if you are not familiar with the game, a brief explanation should suffice. Taking turns, you place checkers on the board in an attempt to have more than your opponent at the end. Each time you trap a row of your opponent's counters between two of yours, they change colour to show they now belong to you.

To enter the program just follow the instructions given in the hexloader program. You can save the program in parts, saving each part with CSAVEM"Reversi",4608,X,O where X is the address you reached. Don't forget to load previous parts before typing in a new one. Save the complete program with

CSAVEM"Reversi",4608,13823,5430

before executing it. To play type

CLOADM:EXEC

Hexloader.

```
10 REM HEXLOADER - ENTER THE
20 REM STRING OF HEX DIGITS FIRST
30 REM AND THEN THE CHECKSUM
40 PRINT "ENTER START ADDRESS ";:INPUT START
50 PRINT "ENTER FINISH ADDRESS";:INPUT FINISH
60 FOR N = START TO FINISH STEP 8
65 PRINT N;": ";
70 TT=0:INPUT A$:Z=0
80 FOR D=1 TO LEN(A$) STEP 2
90 P=VAL("&H"+MID$(A$,D,2))
100 TT=TT+P:POKE(N+Z),P
110 Z=Z+1:NEXT
120 PRINT " = ";
130 INPUT T$
150 IF VAL(T$)<>TT THEN PRINT "ERROR - ENTER LINE AGAIN":GOTO 70
160 NEXT
```

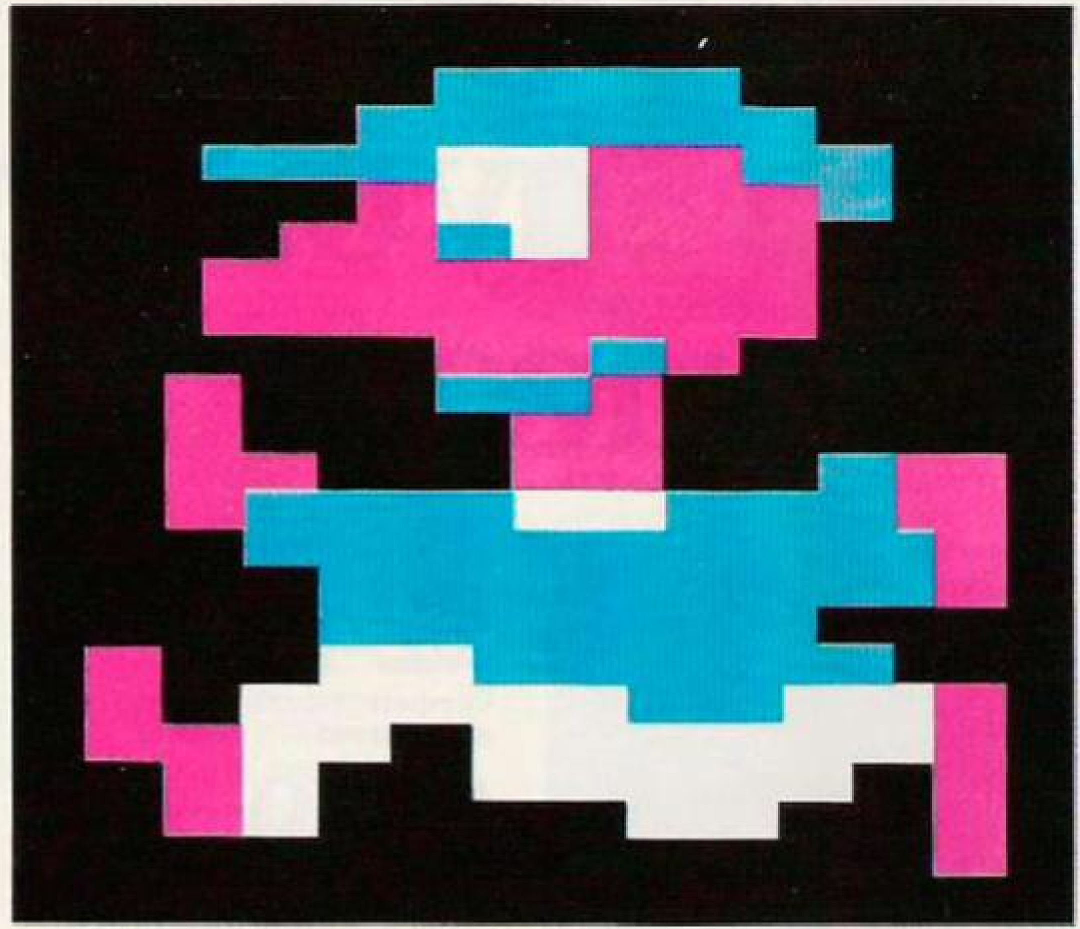
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Make new friends,



With Mirrorsoft games, you can make loads of new friends like Mr. Bounce and Ceasar the Cat. Or, now, like Dr. Frankenstein, you can create your very own monsters and aliens. As well as friends and heroes to defeat them.

GAMES CREATOR

Invent your own games. As simple or as complex as you care to make them. The only real limit is your imagination.

For the CBM64, the Games Creator comes with a step-by-step manual and three ready-to-play games. Each demonstrates some of the programs exceptional features: shapes, movement, speed, scrolling backgrounds, scoring, music, sound effects and many more. And you don't need to know any program language to work it.

On fast loading cassette for the CBM64. **£12.95.**

STAR EGGS

A space fantasy. Earth is threatened by attack from Alien life-forms hatching out in space. You must first overcome the Guardians. Then into the Hatchery, up and down escalators and ladders to crack the eggs before the aliens escape.

On fast loading cassette for the CBM64. **£6.95**

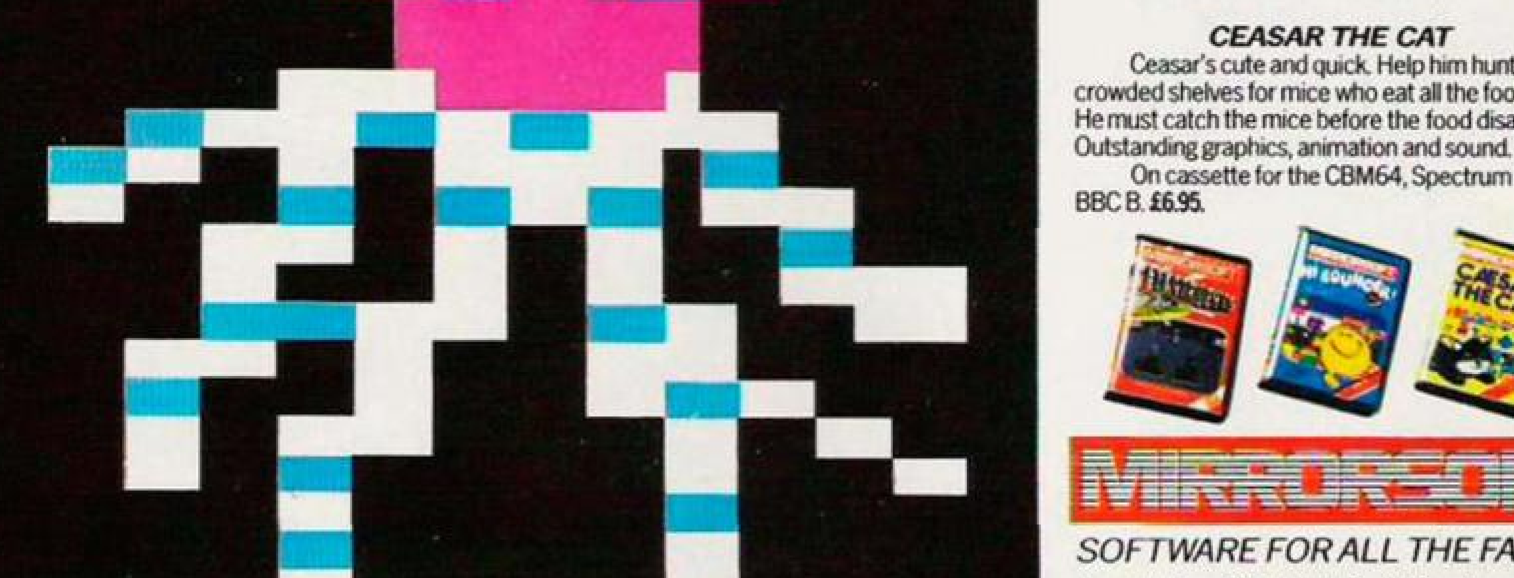
CATASTROPHES

Use a helicopter to build a hotel on an island paradise. But you have to move fast and design your building carefully because earthquakes, floods, storms and lightning can strike at any moment.

For one or two players. On fast loading cassette for the CBM64. **£6.95**

and enemies.





HI-BOUNCER

An arcade type game featuring Mr. Bounce and the Mr. Men. But don't get the idea that it's just a kids' game. Far from it. There are four main screens each with eight levels of difficulty and complexity. Don't worry, there's also a practice program with slower speeds.

On cassette for the BBC B. **£6.95.**

CEASAR THE CAT

Ceasar's cute and quick. Help him hunt the crowded shelves for mice who eat all the food. He must catch the mice before the food disappears. Outstanding graphics, animation and sound.

On cassette for the CBM64, Spectrum 48K, BBC B. **£6.95.**

MIRRORSOFT

SOFTWARE FOR ALL THE FAMILY

Available from Boots, W.H. Smith, Spectrum and all good software stockists. Write for a free catalogue to: Mirrorsoft, Holborn Circus, London, EC1P 1DQ.

Before you compare our new computer system with any other, double the price.



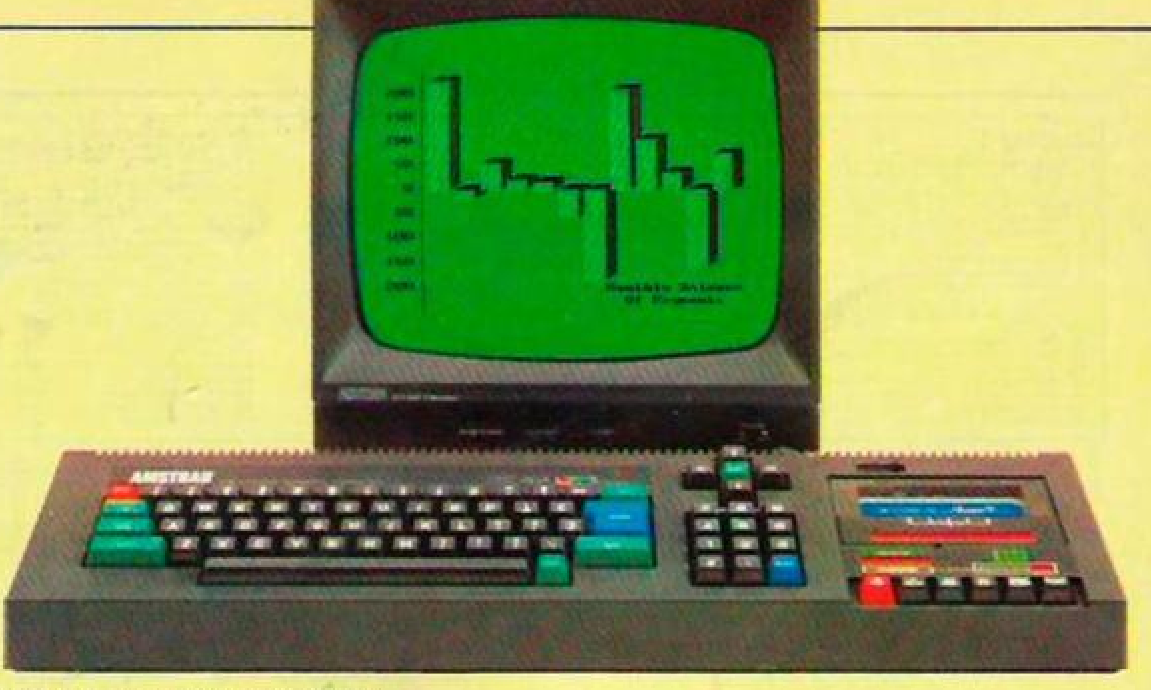
Other computer systems that get anywhere near the new CPC464 on specification cost around twice as much.

Which other home computer, for instance, gives you 64K of RAM (42K available), 32K of ROM and a colour monitor or VDU?

Which other home computer, gives you a built-in cassette data recorder, typewriter style keyboard, numeric keypad and a very fast extended BASIC?

And which other home computer offers it all for £359 with colour monitor or £249 with green screen VDU?

What's more, the CPC464 comes complete and ready-to-go. Just plug it in.



CPC464 green screen VDU (GT64)

64K RAM.

Pound for pound, other micros can't match the CPC464's memory. Over 42K is available to users, thanks to the implementation of ROM overlay techniques.

So there's plenty of room for sophisticated and complex programs.

High resolution graphics. Stereo sound.

The monitor drives each colour on the screen directly from the computer. There's no unnecessary circuitry to distort your view. No tuning problems. And no arguments about who's using the computer and who's watching TV.

Sounds good, doesn't it?

So does the CPC464 with its 3-voice, 7-octave stereo output fed through a hi-fi amplifier and speakers.

Amsoft. High quality software.

A rapidly expanding range of programs is already available. High quality software that takes full advantage of the CPC464's high specification and speed-loading capability.

Which means even complex programs can be loaded quickly.

Arcade games, educational programs and business applications are all designed to utilise the CPC464's impressive graphics, sound and processing abilities.



Green screen VDU.

Text and numerical data are bright, sharp and easily read at a glance. Which is invaluable for word processing, accounting, budgeting and developing programs. And this purpose designed visual display system has an 80 column text display.

Green screen versions of the CPC464 can be used with a colour TV by connecting the optional power supply and modulator MP-1.

Amstrad. User Club.

The CPC464 User Club is run by Amsoft, our software division, which provides software, peripherals and publications for members.

As a member, you'll enjoy immediate benefits like the privilege card, Club binder, regular magazine, competitions for valuable prizes and contact with other Amstrad users.

Whether you're interested in commercial applications or you're a games fanatic, you'll want to join the Club.

AMSTRAD CPC 464 User club
MEMBERSHIP NUMBER
REGISTERED NAME
EXPIRY DATE
NOT TRANSFERABLE SEE MEMBERSHIP CONDITIONS FOR TERMS OF USE

CPC464. Unlimited scope for expansion.

At Amstrad, we try to anticipate your future requirements. That's why there's a built-in parallel printer interface. A low cost optional disk drive system including CP/M* and LOGO. A joystick port. And the virtually unlimited potential of the Z80 data bus with sideways ROM support.



Optional disk drive DDI-1 including interface CP/M* and LOGO £199.95

Optional 80 column dot matrix printer DMP-1. Offers high performance computerised text processing for only £199.95.

BOOTS COMET Dixons
Menzies RUMBELOWS AND OTHER COMPUTER STORES

AMSTRAD
ONE GREAT IDEA AFTER ANOTHER

*Trade mark Digital Research

I'd like to know more about the quite exceptional CPC464 complete computer system. Please send literature right away.

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To: Amstrad Consumer Electronics plc, Brentwood House, 169 King's Road, Brentwood, Essex CM14 4EF. Tel: Brentwood (0277) 228888.



YC5

Listing 1.

```
1 REM**********************
2 REM[illegible]
3 REM* [illegible] *
4 REM* [illegible] *
5 REM* [illegible] *
6 REM[illegible]
7 REM* BY *
8 REM* [illegible] *
9 REM**********************
10 REM[illegible]
11 POKE51,0:POKE55,0
12 POKE52,52:POKE56,54:[illegible]:GOSUB500
15 GOTO200
20 [illegible]
30 INPUT"START POSITION";A$
40 IFLEN(A$)<>4THEN30
45 GOSUB[illegible]
50 FORN=1TO4
60 [illegible]
70 FORN=0TO15
80 IF[illegible]THEN110
90 NEXTN
100 GOTO[illegible]
110 [illegible]
120 NEXTN
130 IF[illegible]THEN[illegible]
140 RETURN
200 POKE52,54:POKE56,54:GOSUB[illegible]
210 GOSUB[illegible]:PRINT[illegible]
220 GOSUB[illegible]:IF[illegible]THEN[illegible]
230 [illegible]:PRINT[illegible]
240 GOSUB[illegible]:IF[illegible]THEN240
250 POKE[illegible]:PRINT[illegible]
340 IF[illegible]THEN210
350 END
500 FORN=0TO9:[illegible]:NEXT
510 FORN=10TO15:[illegible]:NEXT
520 RETURN
550 GETA$:IFA$=""THEN550
560 FORN=0TO15:IF[illegible]THENRETURN
570 NEXT
580 N=16:RETURN
600 [illegible]/16
610 [illegible]/4096
620 [illegible]
630 RETURN
690 REM[illegible]
700 [illegible]
710 [illegible]
720 [illegible]
730 [illegible]
740 [illegible]
750 [illegible]
760 [illegible]
770 [illegible]
780 [illegible]
790 [illegible]
800 FORN=0TO6
810 [illegible]
820 FORN=AT0[illegible]:NEXT
830 PRINT[illegible]
840 PRINT[illegible]
850 NEXTN
860 END
[illegible] REM[illegible]
900 POKE52,54:POKE56,54:[illegible]:GOSUB500
910 GOSUB[illegible]
920 GOSUB[illegible]
930 [illegible]
940 [illegible]/16
950 [illegible]
960 NEXT[illegible]
970 PRINT[illegible]
980 IF[illegible]THEN[illegible]
990 [illegible]
1000 GOTO[illegible]
[illegible] REM[illegible]
1100 [illegible]
1110 [illegible]
1120 NEXT[illegible]
1130 SYS[illegible]
1200 DATA[illegible]
1210 DATA[illegible]
1220 DATA[illegible]
1230 DATA[illegible]
1240 DATA[illegible]
```

TIRADIANS

David Rees with a CBM-64 program to save the world.

TIRADIANS IS another chapter in the Galaxians saga. A fleet of alien spacecraft shaped in the aliens' own image have grouped over part of planet earth. Swooping down, smaller groups enter the atmosphere to destroy industrial and population centres. You have Earth's only laser base, and your task is to destroy as many alien waves as possible.

You score when your laser bolt hits a Tiradian. Troops — blue ships with yellow eyes — are worth 20 points; Troop supervisors — troops with yellow moustaches — are worth 40 points; Flight leaders — colourful



troops — are worth 80 points; and wave leaders — with the large guns — are worth 160 points. If you manage to hit them while they are swooping down, the above scores are doubled.

Tiradians comes in two parts, a Basic section which sets up registers, updates the scores etc., and a code section which contains graphics and machine code. The code length is rather long, so listing 1 contains a hex loader program. Type in and save this, and save the Basic program — listing 2 — afterwards.

Then, run the program in listing 1. This now allows you to type the code in the hex form of listing 3. The first prompt after running allows you to enter the location from which code will be typed in, the location being in the same form as the locations in listing 3. This allows you to start or resume at any location in the code section. If you have had enough for one day,

RUN 1100

will save the code. To resume, load the main Basic program — to load the code — and then load the hex input program.

Hex dump.

3600	A0	74	74	A0	61	6C	65	72
3608	74	BA	A0	74	69	72	61	64
3610	69	61	6E	73	A0	6F	6E	A0
3618	A0	A0	61	6C	65	72	74	BA
3620	A0	74	69	72	61	64	69	61
3628	6E	73	A0	6F	6E	6E	A0	61
3630	6C	65	72	74	BA	A0	74	69
3638	72	61	64	69	61	6E	73	A0
3640	6F	6F	A0	61	6C	65	72	74
3648	BA	A0	74	69	72	61	64	69
3650	61	6E	73	A0	A0	A0	61	6C
3658	65	72	74	BA	A0	74	69	72
3660	61	64	69	61	6E	73	73	A0
3668	61	6C	65	72	74	BA	A0	74
3670	69	72	61	64	69	61	6E	6E
3678	A0	61	6C	65	72	74	BA	A0
3680	74	69	72	61	64	69	61	61
3688	A0	61	6C	65	72	74	BA	A0
3690	74	69	72	61	64	69	69	A0
3698	61	6C	65	72	74	BA	A0	74
36A0	69	72	61	64	64	A0	61	6C
36A8	65	72	74	BA	A0	74	69	72
36B0	61	61	A0	61	6C	65	72	74
36B8	BA	A0	74	69	72	72	A0	61
36C0	6C	65	72	74	BA	A0	74	69
36C8	69	A0	61	6C	65	72	74	BA
36D0	A0	74	74	A0	61	6C	65	72
36D8	74	BA	A0	A0	A0	61	6C	65
36E0	72	74	BA	BA	A0	61	6C	65
36E8	72	74	74	A0	61	6C	65	72
36F0	72	A0	61	6C	65	65	A0	61
36F8	6C	6C	A0	61	61	A0	A0	A0
3700	AD	76	03	85	1C	A5	19	4A
3708	18	4A	18	4A	18	4A	18	4A
3710	18	AA	AD	75	03	E0	00	F0
3718	0B	18	69	50	90	03	18	E6
3720	1C	CA	D0	F5	85	1B	A5	1D
3728	29	1E	85	1A	0A	18	65	1A
3730	18	4A	18	65	1B	90	03	18
3738	E6	1C	85	1B	A0	00	A9	20
3740	91	1B	C8	91	1B	C8	91	1B
3748	60	00	FF	FF	00	00	FF	FF
3750	00	00	FF	FF	00	00	FF	FF
3758	00	00	FF	FF	00	00	FF	FF
3760	00	00	FF	FF	00	00	FF	FF
3768	00	00	FF	FF	00	00	FF	FF
3770	00	00	FF	FF	00	00	FF	FF
3778	00	00	FF	FF	00	81	FF	F7
3780	85	FE	A5	FE	18	69	02	18
3788	AA	C8	C8	B9	F8	07	60	00
3790	FF	FF	00	00	00	00	FF	FF

3798	00	00	FF	FF	00	00	FF	FF
37A0	00	00	FF	FF	00	00	FF	FF
37A8	00	00	FF	FF	00	00	FF	FF
37B0	00	00	FF	FF	00	00	FF	FF
37B8	00	00	FF	FF	00	00	FF	FF
37C0	0C	00	00	0C	00	00	0C	00
37C8	00	0C	00	00	00	00	00	00
37D0	00	00	00	00	00	00	00	00
37D8	00	00	00	00	00	00	00	00
37E0	00	00	00	00	00	00	00	00
37E8	00	00	00	00	00	00	00	00
37F0	00	00	00	00	00	00	00	00
37F8	00	00	00	00	00	00	00	00
3800	3C	66	6E	6E	60	62	3C	00
3808	18	3C	66	7E	66	66	66	00
3810	7C	66	66	7C	66	66	7C	00
3818	3C	66	60	60	60	66	3C	00
3820	78	6C	66	66	66	6C	78	00
3828	7E	60	60	78	60	60	7E	00
3830	7E	60	60	78	60	60	60	00
3838	3C	66	60	6E	66	66	3C	00
3840	66	66	66	7E	66	66	66	00
3848	3C	18	18	18	18	18	3C	00
3850	1E	0C	0C	0C	0C	6C	38	00
3858	66	6C	78	70	78	6C	66	00
3860	60	60	60	60	60	60	7E	00
3868	63	77	7F	6B	63	63	63	00
3870	66	76	7E	7E	6E	66	66	00
3878	3C	66	66	66	66	66	3C	00
3880	7C	66	66	7C	60	60	60	00
3888	3C	66	66	66	66	3C	0E	00
3890	7C	66	66	7C	78	6C	66	00
3898	3C	66	60	3C	06	66	3C	00
38A0	7E	18	18	18	18	18	18	00
38A8	66	66	66	66	66	66	3C	00
38B0	66	66	66	66	66	3C	18	00
38B8	63	63	63	6B	7F	77	63	00
38C0	66	66	3C	18	3C	66	66	00
38C8	66	66	66	3C	18	18	18	00
38D0	7E	06	0C	18	30	60	7E	00
38D8	18	18	3C	3C	66	66	7E	7E
38E0	66	66	66	66	66	66	00	00
38E8	78	78	6C	6C	66	66	66	66
38F0	66	66	6C	6C	78	78	00	00
38F8	3C	3C	18	18	18	18	18	18
3900	00	00	00	00	00	00	00	00
3908	18	18	18	18	3C	3C	00	00
3910	66	66	66	00	00	00	00	00
3918	66	66	76	76	7E	7E	7E	7E
3920	6E	6E	66	66	66	66	00	00
3928	7C	7C	66	66	66	66	7C	7C
3930	78	78	6C	6C	66	66	00	00

3938	06	0C	18	00	00	00	00	00
3940	0C	18	30	30	30	18	0C	00
3948	30	18	0C	0C	0C	18	30	00
3950	3C	3C	66	66	60	60	3C	3C
3958	06	06	66	66	3C	3C	00	00
3960	00	00	00	00	00	18	18	30
3968	7E	7E	18	18	18	18	18	18
3970	18	18	18	18	18	18	00	00
3978	00	03	06	0C	18	30	60	00
3980	3C	66	6E	76	66	66	3C	00
3988	18	18	38	18	18	18	7E	00
3990	3C	66	06	0C	30	60	7E	00
3998	3C	66	06	1C	06	66	3C	00
39A0	06	0E	1E	66	7F	06	06	00
39A8	7E	60	7C	06	06	66	3C	00
39B0	3C	66	60	7C	66	66	3C	00
39B8	7E	66	0C	18	18	18	18	00
39C0	3C	66	66	3C	66	66	3C	00
39C8	3C	66	66	3E	06	66	3C	00
39D0	00	00	18	00	00	18	00	00
39D8	00	00	18	00	00	18	18	30
39E0	01	03	07	0F	1F	3F	7F	FF
39E8	00	00	7E	00	7E	00	00	00
39F0	80	C0	E0	F0	F8	FC	FE	FF
39F8	3C	66	06	0C	18	00	18	00
3A00	00	00	00	00	00	00	00	00
3A08	03	03	03	03	00	00	00	00
3A10	00	00	00	00	03	03	03	03
3A18	00	00	00	00	00	00	00	00
3A20	00	00	00	00	00	00	00	00
3A28	0C	0C	0C	0C	00	00	00	00
3A30	00	00	00	00	0C	0C	0C	0C
3A38	00	00	00	00	00	00	00	00
3A40	00	00	00	00	00	00	00	00
3A48	30	30	30	30	00	00	00	00
3A50	00	00	00	00	30	30	30	30
3A58	00	00	00	00	00	00	00	00
3A60	00	00	00	00	00	00	00	00
3A68	C0	C0	C0	C0	00	00	00	00
3A70	00	00	00	C0	C0	C0	C0	00
3A78	00	00	00	00	00	00	00	00
3A80	00	00	00	00	0C	0C	37	37
3A88	15	19	08	2A	2E	0C	3F	33
3A90	00	00	00	01	0D	3D	3D	0D
3A98	01	01	01	01	01	01	01	00
3AA0	00	01	05	15	15	05	01	00
3AA8	00	00	40	50	50	40	00	00
3AB0	01	05	16	5A	5A	16	05	01
3AB8	00	40	50	94	94	50	40	00
3AC0	02	06	2B	AF	AF	2B	06	02
3AC8	00	80	A0	E8	E8	A0	80	00
3AD0	03	0F	3C	F0	F0	3C	0F	03

3AD8	00	C0	F0	3C	3C	F0	C0	00
3AE0	00	00	00	00	00	00	00	00
3AE8	00	00	00	00	00	00	00	00
3AF0	01	01	00	05	40	00	05	40
3AF8	00	1D	D0	00	45	44	00	15
3B00	01	00	00	05	40	00	05	40
3B08	00	19	90	00	45	44	00	15
3B10	50	00	44	44	00	04	40	00
3B18	00	00	00	00	00	00	00	00
3B20	00	00	00	00	00	00	00	00
3B28	00	00	00	00	00	00	00	00
3B30	00	00	00	00	00	00	00	00
3B38	00	00	00	00	00	00	00	00
3B40	04	40	00	05	40	00	59	94
3B48	00	15	50	00	25	60	00	A5
3B50	68	00	81	00	00	00	00	00
3B58	00	00	00	00	00	00	00	00
3B60	00	00	00	00	00	00	00	00
3B68	00	00	00	00	00	00	00	00
3B70	00	00	00	00	00	00	00	00
3B78	00	00	00	00	00	00	00	00
3B80	0C	C0	00	0F	C0	00	FB	BC
3B88	00	3F	F0	00	3F	F0	00	1F
3B90	D0	00	53	14	00	40	04	00
3B98	00	00	00	00	00	00	00	00
3BA0	00	00	00	00	00	00	00	00
3BA8	00	00	00	00	00	00	00	00
3BB0	00	00	00	00	00	00	00	00
3BB8	00	00	00	00	00	00	00	00
3BC0	00	00	00	42	04	00	4A	84
3BC8	00	6B	A4	00	6F	E4	00	1F
3BD0	D0	00	03	00	00	03	00	00
3BD8	00	00	00	00	00	00	00	00
3BE0	00	00	00	00	00	00	00	00
3BE8	00	00	00	00	00	00	00	00
3BF0	00	00	00	00	00	00	00	00
3BF8	00	00	00	00	00	00	00	FF
3C00	01	05	05	1D	45	15	44	04
3C08	00	40	40	D0	44	50	44	40
3C10	00	00	00	00	00	00	00	00
3C18	00	01	01	07	11	05	11	01
3C20	40	50	50	74	51	54	11	10
3C28	00	00	00	00	00	00	00	00
3C30	00	00	00	01	04	01	04	00
3C38	10	54	54	DD	54	55	44	44
3C40	00	00	00	00	40	00	40	00
3C48	00	00	00	00	01	00	01	00
3C50	04	15	15	77	15	55	11	11
3C58	00	00	00	40	10	40	10	00
3C60	00	00	00	00	00	00	00	00
3C68	01	05	05	1D	45	15	44	04
3C70	00	40	40	D0	44	50	44	40

Listing 2.

```
[illegible]
```

Once you think you have all the code in,

RUN 700

will give the actual and correct totals for sections of the code, to give an idea as to whether there are any errors. If any sections are wrong,

RUN 900

will allow you to list the offending area in the same format as the magazine listing. You can then run the hex loader, and correct any mistakes. If you want to save and load the code on disc, change the following lines:

Hex loader: 1220 DATA 162,8,160,255,32,186,255

Basic: 10000 DATA 162,8,160,255,32,186,255

One final note. Check, by Peeking locations 788 and 789, whether the values contained within them are 49 and 234 respectively. If your values differ from those above, then lines 1330-1350, and line 1370 may all be omitted.

3C78	01	05	45	1D	45	15	04	04
3C80	00	40	44	D0	44	50	40	40
3C88	00	00	00	00	00	00	00	00
3C90	00	01	11	07	11	05	01	01
3C98	40	50	51	74	51	54	10	10
3CA0	00	00	00	00	00	00	00	00
3CA8	00	00	04	01	04	01	00	00
3CB0	10	54	54	DD	54	55	44	44
3CB8	00	00	40	00	40	00	00	00
3CC0	00	00	01	00	01	00	00	00
3CC8	04	15	15	77	15	55	11	11
3CD0	00	00	10	40	10	40	00	00
3CD8	00	00	00	00	00	00	00	00
3CE0	01	05	45	1D	45	15	04	04
3CE8	00	40	44	D0	44	50	40	40
3CF0	04	05	5D	15	35	F5	C1	00
3CF8	40	40	D4	50	70	7C	0C	00
3D00	00	00	00	00	00	00	00	00
3D08	01	01	17	05	0D	3D	30	00
3D10	10	50	75	54	5C	5F	43	00
3D18	00	00	00	00	00	00	00	00
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3D30	00	00	40	00	00	C0	C0	00
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3D48	00	00	50	40	C0	F0	30	00
3D50	00	00	00	00	00	00	00	00
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3D70	40	40	D4	5C	7C	70	00	00
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3D98	00	00	05	0D	0F	03	00	00
3DA0	44	54	DD	55	57	57	10	00
3DA8	00	00	40	C0	C0	00	00	00
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3DB8	11	15	77	55	D5	D5	04	00
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3DC8	00	00	00	00	00	00	00	00
3DD0	04	05	5D	D5	F5	35	01	00
3DD8	40	40	D4	5C	7C	70	00	00
3DE0	08	0A	AE	2A	2A	1A	52	40
3DE8	80	80	E8	A0	A0	90	14	04
3DF0	00	00	00	00	00	00	00	00
3DF8	02	02	2B	0A	0A	06	14	10
3E00	20	A0	BA	A8	A8	A4	85	01
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3E98	00	00	80	00	40	40	00	00
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4010	FC	B9	00	D0	BE	01	CF	E0
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4028	F9	00	CF	B0	02	C6	FC	18
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4038	08	A5	FB	0D	10	D0	18	90
4040	07	A5	FB	49	FF	2D	10	D0
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40C8	FF	FF	00	00	FF	FF	00	00
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40F8	FF	FF	00	00	FF	FF	00	00
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4140	4A	18	8D	FB	CF	A4	02	B9
4148	29	CF	18	0A	18	A8	18	4A
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4158	18	0A	18	CA	D0	FA	2D	10
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41A8	85	FD	AD	FB	CF	38	ED	FD
41B0	CF	B0	02	49	FF	18	AC	20
41B8	CF	C0	00	F0	05	4A	18	EC
41C0	D0	FB	C9	00	F0	05	A9	00
41C8	18	90	02	A9	01	25	FD	18
41D0	90	02	A9	00	A4	02	99	31
41D8	CF	C8	C0	08	D0	A1	A0	00
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41E8	C0	08	D0	F6	60	00	FF	FF
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4258	A0	00	B1	FC	A4	02	99	3A
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4268	10	D0	9D	60	FF	FF	00	00
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42B8	FF	FF	00	00	FF	FF	00	02
42C0	FF	FF	00	00	FF	FF	00	00
42C8	FF	FF	00	00	FF	FF	00	00
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42D8	FF	FF	00	00	FF	FF	00	00
42E0	FF	9A	00	00	FF	FF	00	00
42E8	FF	FF	00	00	FF	FF	00	00

(continued on page 111)



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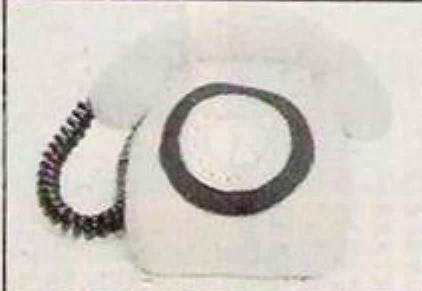
SPORTS HERO

Melbourne House

(Hex dump continued from page 109)

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4308  76 03 85 FC 18 69 D4 18
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4340  03 18 A4 1A 99 00 C4 A4
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4398  FD A5 02 18 69 03 18 85
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43B0  FB 18 69 50 90 05 18 E6
43B8  FC E6 FE 85 FB 85 FD EE
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43C8  03 4C 1A 43 18 AD A6 03
43D0  C9 00 F0 01 60 A0 00 B9
43D8  99 03 F0 01 60 C8 C0 06
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4408  2F D0 0C AD AB 03 38 E9
4410  01 B0 01 60 18 90 10 C9
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4428  AB 03 18 69 0C 18 0A 8D
4430  00 D0 B0 09 AD 10 D0 29
4438  FE 8D 10 D0 60 18 AD 10
4440  D0 09 01 8D 10 D0 60 C9
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4490  00 D0 06 20 0B 44 18 90
4498  0B A5 FB 29 08 C9 00 D0
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44C0  20 00 40 20 00 41 20 00
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4588  18 69 0F B0 03 18 69 0F
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4760  99 81 03 A5 FC 99 82 03
4768  A9 54 99 83 03 A9 00 8D
4770  04 D4 8D 02 CF A9 0A 8D
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4830  05 D0 99 04 CF 99 14 CF
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48E8  18 99 3C 03 E8 B9 3C 03
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4908  F0 01 60 8D ?? 07 E9 00
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4918  AD 03 18 69 01 18 C9 57
4920  D0 0D A9 00 8D AC 03 A9
4928  0C 8D 77 03 4C 00 43 8D
4930  AD 03 29 01 F0 07 A9 0F
4938  85 FB AD AD 03 29 06 4A
4940  18 AA A9 07 E0 00 F0 07
4948  18 69 07 18 CA D0 F9 18
4950  65 FB 18 8D 77 03 AD AD
4958  03 4A 18 4A 18 4A 18 69
4960  78 18 8D 75 03 4C 00 43
4968  AD AD 03 38 E9 01 B0 09
4970  A9 01 8D AC 03 A9 00 8D
4978  77 03 4C 00 43 18 8D AD
4980  03 29 01 F0 02 A9 0F 85
4988  FB AD AD 03 29 06 4A 18
4990  AA A9 00 18 90 AE FF FF
4998  00 00 FF FF 00 00 FF FF
49A0  00 00 FF FF 00 00 FF FF
49A8  00 00 FF FF 00 00 FF FF
49B0  00 00 FF FF 00 00 FF FF
49B8  00 00 FF FF 00 00 FF FD
49C0  EE DD 03 AD DD 03 29 01
49C8  F0 01 60 A0 00 84 FD B9
49D0  82 03 F0 38 85 FC B9 81
49D8  03 85 FB B9 83 03 A0 00
49E0  91 FB 18 69 01 18 C8 91
49E8  FB A5 FC 18 69 D4 18 85
49F0  FC A0 00 A9 0F 91 FB C8
49F8  91 FB A4 FD B9 83 03 18
4A00  69 02 18 C9 5E D0 05 A9
4A08  00 99 82 03 99 83 03 C8
4A10  C8 C8 84 FD C0 18 D0 B7
4A18  60 FF 00 00 FF FF 00 00
4A20  FF FF 00 00 FF FF 00 00
4A28  FF FF 00 00 FF FF 00 00
4A30  FF FF 00 00 FF FF 00 00
4A38  FF FF 00 00 FF FF 00 00
4A40  EE DE 03 AD DE 03 29 01
4A48  F0 01 60 A0 00 84 FD B9
4A50  54 03 D0 03 4C D9 4A 85
4A58  FC B9 53 03 85 FB B9 55
4A60  03 85 FE 29 03 18 69 01
4A68  18 85 FF A5 FE 29 FC 18
4A70  65 FF 18 99 55 03 A0 00
4A78  91 FB A5 FC 18 69 D4 18
4A80  85 FC A9 01 91 FB A4 FD
4A88  A5 FF C9 03 D0 4F B9 54
4A90  03 85 FC C9 07 D0 10 A5
4A98  FB 38 E9 78 90 09 18 A9
4AA0  00 99 54 03 18 90 32 A5
4AA8  FE 29 FC 18 09 01 99 55
4AB0  03 85 FE A5 FB 18 69 28
4AB8  90 03 18 E6 FC 85 FB 99
4AC0  53 03 A5 FC 99 54 03 A0
4AC8  00 A5 FE 91 FB A5 FC 18
4AD0  69 D4 18 85 FC A9 01 91
4AD8  FB E6 FD E6 FD E6 FD A4
4AE0  FD C0 18 F0 03 4C 4F 4A
4AE8  60 00 00 FF FF FF 00 00
4AF0  FF FF 00 00 FF FF 00 00
4AF8  FF FF 00 00 FF FF 00 00
4B00  A0 00 A9 C0 85 1E A2 08
4B08  AD 1F D4 29 E0 C9 E0 D0
4B10  02 A9 00 C9 C0 D0 02 A9
4B18  20 85 19 AD 1B D4 29 0E
4B20  C9 0E D0 02 A9 08 C9 0C
4B28  D0 02 A9 06 C9 0A D0 02
4B30  A9 04 18 65 19 18 65 20
4B38  18 85 1D C8 B1 1D 29 07
4B40  85 1F 88 B1 1D D0 06 C8
4B48  D0 EE A2 01 60 A2 00 60
4B50  00 00 FF FF 00 00 FF FF
4B58  00 00 FF FF 00 00 FF FF
4B60  00 05 FF FF 00 00 FF FF
4B68  00 00 FF FF 00 00 FF FF
4B70  00 00 FF FF 00 00 FF FF
4B78  00 00 FF FF 00 00 FF FF
4B80  85 1A A4 FF 29 7F A2 EC
4B88  38 E9 1E E8 B0 FA CA 9A
4B90  99 FA 07 A5 1F 99 29 D0
4B98  A9 01 99 99 03 A0 00 A9
4BA0  00 91 1D A5 FF 0A 18 A8
4BA8  A9 C0 99 AF 03 A9 00 85
4BB0  1C A5 1D 99 AE 03 29 1E
4BB8  0A 18 69 04 18 0A 18 95
4BC0  18 0A 90 03 18 E6 1C 18
4BC8  65 18 90 03 18 E6 1C 99
4BD0  BA 02 A5 1C 99 BB 03 AD
4BD8  AD 03 EA 18 79 BA 03 90
4BE0  03 18 E6 1C 99 04 D0 05
4BE8  1C D0 00 A9 FF 45 ?? ??
4BF0  10 D0 18 90 05 AD 10 D0
4BF8  05 02 8D 10 D0 A5 19 FA
4C00  EA 99 C7 03 A5 19 4A 18
4C08  69 4A 18 99 C6 03 99 05
4C10  D0 4C 00 37 DE 03 00 00
4C18  FF FF 00 00 FF FF 00 00
4C20  FF FF 00 00 FF FF 00 00
4C28  FF FF 00 00 FF FF 00 00
4C30  FF FF 00 00 FF FF 00 00
4C38  FF FF 00 00 FF FF 00 00
4C40  AD 1E D4 29 07 F0 01 60
4C48  A2 00 A9 00 85 FF 85 1E
4C50  B9 99 03 F0 19 98 0A 18
4C58  A8 B9 05 D0 38 E5 FF 90
4C60  09 18 98 85 1E B9 05 D0
4C68  85 FF 98 4A 18 A8 C8 E0
4C70  E0 07 D0 DC A5 FF 38 E9
4C78  AE D0 01 60 A5 FF 38 E9
4C80  DA 90 02 18 60 A0 00 B9
4C88  54 03 F0 05 C8 C8 C8 C0
4C90  18 D0 F4 60 84 1D A4 1E
4C98  B9 04 D0 05 18 E9 05 D0
4CA0  38 E9 32 18 4A 18 4A 18
4CA8  4A 18 85 1C A5 1E 4A 18
4CB0  A8 A9 04 C0 00 F0 05 0A
4CB8  18 88 D0 FB 2D 10 D0 AA
4CC0  A5 1E 4A 18 E0 00 F0 02
4CC8  09 80 38 E9 08 18 4A 18
4CD0  4A 18 85 1B 38 E9 28 90
4CD8  02 18 60 A4 1C A9 04 85
4CE0  1C A5 1B C0 00 F0 0B 18
4CE8  69 28 90 03 18 E6 1C 88
4CF0  D0 F5 A4 1D 99 53 03 A5
4CF8  1C 99 54 03 4C C0 51 55
4D00  A2 00 98 4A 18 A8 B9 99
4D08  03 85 FF 98 0A 18 A8 A5
4D10  FF F0 13 A5 FB 99 04 CF
4D18  A5 FC 49 01 99 05 CF A5
4D20  FD 99 14 CF A5 FE 49 01
4D28  99 15 CF C8 C8 E8 E0 03
4D30  D0 D0 60 FF C9 05 00 FF
4D38  FF C9 05 D0 01 60 A9 00
4D40  C9 05 D0 01 60 A9 00 8D
4D48  08 D4 A9 0A 8D 0C D4 A9
4D50  01 8D 0D D4 A9 11 8D 0B
4D58  D4 A9 FF 38 F9 6F 03 18
4D60  4A 18 69 05 18 8D 09 D4
4D68  C0 00 F0 02 A0 03 20 40
4D70  4C AD 4F 03 A0 00 60 FF
4D78  00 00 FF FF 00 00 FF 7F
4D80  A9 00 85 FC 85 FE A9 01
4D88  85 FD A9 03 85 FB AD 6D
4D90  03 D0 52 AD 1B D4 29 1F
4D98  F0 01 60 AD 1B D4 29 01
4DA0  18 69 01 18 8D 6D 03 18
4DA8  69 01 18 8D A3 03 A9 00
4DB0  85 FF 85 20 A9 04 85 02
4DB8  20 00 4B E0 00 D0 03 20
4DC0  00 4B CE A3 03 E6 FF D0
4DC8  02 AD A3 03 D0 EA A0 00
4DD0  A9 4A 8D 6F 03 A9 01 8D
4DD8  4F 03 85 FB 85 FC 85 FD
4DE0  85 FE 20 00 4D AD 4F 03
4DE8  A0 00 20 40 4D C9 04 F0
4DF0  5E C9 05 F0 73 AD 4F 03
4DF8  C9 01 D0 19 CE 6F 03 AD
4E00  6F 03 C9 3C F0 01 60 EE
4E08  4F 03 A9 00 85 FB 85 FC
4E10  85 FE 4C 00 4D EE 6F 03
4E18  C9 02 D0 21 AD 6F 03 C9
4E20  88 F0 01 60 AD 6D 03 49
4E28  03 18 6D 4F 03 18 8D 4F
4E30  03 AD 6D 03 18 69 01 18
4E38  85 FB 4C 00 4D AD 6F 03
4E40  C9 C8 F0 01 60 A9 01 85
4E48  FC EE 4F 03 4C 00 4D EE
4E50  6F 03 AD 6F 03 C9 ?? F0
4E58  01 60 A9 00 85 FF A9 02
4E60  85 FB EE 4F 03 4C 00 4D
4E68  A9 04 85 FC EE 6F 03 EE
4E70  6F 03 A0 00 AD AD 03 29
4E78  FF 85 FB B9 8F 03 A8 B9
4E80  DA 03 18 65 FE 90 07 18
4E88  ?? 99 04 D0 60 00 D0 00
4E90  A9 FF 45 FC 2D 10 D0 15
4E98  90 05 AD 10 D0 05 FC 8D
4EA0  10 D0 C8 C8 06 FC C0 06
4EA8  D0 D1 AD 6F 03 C9 4A F0
4EB0  01 60 A9 00 8D 6D 03 A0
4EB8  00 B9 99 03 F0 7E A9 00
4EC0  99 99 03 99 00 19 C0 F9
4EC8  C7 03 85 FB B9 AE 03 85
4ED0  FC B9 AF 03 85 FD B9 00
4ED8  99 05 D0 99 14 CF 98 4A
4EE0  18 A8 84 FF A0 00 A5 FE
4EE8  91 FC A4 FF C8 C0 03 D0
4EF0  C8 60 00 00 D0 C9 C0 A0
4EF8  B9 C7 03 18 65 FE 90 02
4F00  A9 01 85 FD 85 FC A9 03
4F08  85 FB A9 00 85 FF AD 6E
4F10  03 D0 54 AD 1B D4 29 1F
4F18  F0 01 60 AD 1B D4 29 01
4F20  18 69 01 18 8D 6E 03 18
4F28  69 01 18 8D A3 03 A9 00
4F30  85 FF A9 0A 85 20 A9 20
4F38  85 02 20 00 4B E0 00 D0
4F40  03 20 80 4B E6 FF 06 02
4F48  CE A3 03 AD A3 03 D0 EA
4F50  A0 06 A9 4A 8D 70 03 A9
4F58  01 8D 51 03 85 FB 85 FE
4F60  A9 00 85 FC 20 00 4D AD
4F68  51 03 A0 01 20 40 4D AD
4F70  51 03 A0 06 C9 04 F0 5E
4F78  C9 05 F0 73 AD 51 03 C9
4F80  01 D0 19 CE 70 03 AD 70
4F88  03 C9 3C F0 01 60 EE 51
4F90  03 A9 00 85 FB 85 FC 85
4F98  FE 4C 00 4D EE 70 03 C9
4FA0  02 D0 21 AD 70 03 C9 98
4FA8  F0 01 60 AD 6E 03 49 03
4FB0  18 6D 51 03 18 8D 51 03
4FB8  AD 6E 03 18 69 01 18 85
4FC0  FB 4C 00 4D AD 70 03 C9
4FC8  C8 F0 01 60 A9 00 85 FC
4FD0  EE 51 03 4C 00 4D EE 70
4FD8  03 AD 70 03 C9 FA F0 01
4FE0  60 A9 00 85 FF A9 02 85
4FE8  FD EE 51 03 4C 00 4D A9
4FF0  20 85 FC EE 70 03 EE 70
4FF8  03 A0 00 AD AD 03 29 FF
5000  85 FB B9 C1 03 AA B9 C0
5008  03 18 65 FB 90 02 18 E8
5010  99 04 D0 E0 00 D0 0A A9
5018  FF 45 FC 2D 10 D0 18 90
5020  05 AD 10 D0 05 FC 8D 10
5028  D0 C8 C8 06 FC C0 06 D0
5030  D1 AD 70 03 C9 4A F0 01
5038  60 A9 00 8D 6E 03 A0 00
5040  B9 9C 03 F0 2E A9 00 99
5048  9C 03 98 0A 18 A8 B9 C0
5050  03 85 FB B9 B4 03 85 FC
5058  B9 B5 03 85 FD A9 A0 99
5060  0B D0 99 1A CF 98 4A 18
5068  A8 84 FF A0 00 A5 FE 91
5070  FC A4 FF C8 C0 03 D0 C0
5078  60 D0 60 00 00 FF 00 00
5080  AE DC 03 AC DD 03 C9 EA
5088  EA C8 00 D0 F9 E0 00 D0
5090  01 60 E8 E0 00 D0 EF 60
5098  FF FF 00 00 FF FF 00 00
50A0  FF FF 00 00 FF FF 00 00
50A8  FF FF 00 00 FF FF 00 00
50B0  FF FF 00 00 FF FF 00 00
50B8  FF FF 00 00 FF FF 00 02
50C0  20 C0 44 20 40 48 20 C0
50C8  48 A9 00 A0 00 99 42 93
50D0  C8 C0 06 D0 F8 20 C0 49
50D8  20 40 4A 20 00 4D 20 00
50E0  4F 20 00 49 20 80 50 A5
50E8  C5 C9 3F D0 01 60 20 80
50F0  51 AD 50 03 F0 CA 60 00
50F8  00 00 00 00 00 20 C0 01
5100  AD 19 D0 29 80 C9 80 F0
5108  03 4C 31 EA AD 00 C1 18
5110  69 01 18 29 01 8D 00 C1
5118  C9 01 D0 22 A9 FF 8D 19
5120  D0 A9 00 8D 15 D0 AD 16
5128  D0 29 EF 8D 16 D0 A9 41
5130  8D 12 D0 AD 11 D0 29 7F
5138  8D 11 D0 4C 31 EA A9 FF
5140  8D 19 D0 A9 FF 8D 15 D0
5148  AD 16 D0 09 10 8D 16 D0
5150  A9 FA 8D 12 D0 AD 11 D0
5158  29 7F 8D 11 D0 A9 FF 8D
5160  19 D0 68 A8 68 AA 68 40
5168  00 00 FF FF 00 00 FF FF
5170  00 00 FF FF 00 00 FF FF
5178  00 00 FF FF 00 00 FF FF
5180  AD 6D 03 F0 12 AD 99 03
5188  D0 0D AD 98 03 D0 08 AD
5190  9E 03 D0 03 4C E2 4E AD
5198  6E 03 F0 12 AD ?? ?? D0
51A0  0D AD ?? 03 D0 08 AD ??
51A8  03 D0 03 4C 29 50 60 FF
51B0  00 00 FF FF 00 00 FF FF
51B8  00 00 FF 4F C0 51 FF FF
51C0  A9 45 99 55 03 60 FF FF
51C8  00 00 FF FF 00 00 FF FF
51D0  45 02 FF FF 00 00 FF FF
51D8  00 00 FF FF 00 00 FF FF
51E0  00 00 FF FF 00 00 FF FF
51E8  00 00 FF FF 00 00 FF FF
51F0  00 00 FF FF 00 00 FF FF
51F8  00 00 FF FF 00 00 FF FF
```







FORTH

K. Wierstra shows you how to get a fairly complete version of Forth on a Spectrum.

This article is available on the Telsoft service.

Figure 1.

```
  1 PRINT : RANDOMIZE USR 37036
 : STOP
  2 PRINT : RANDOMIZE USR 37030
 : STOP
  3 LOAD "CODE"CODE
  4 CLEAR 26111
  5 GO TO 2
```

Figure 3. Hex dump.

[illegible]

THE PROGRAM PRESENTED here is a fairly complete version of the Forth language, written for the Spectrum 48K. This article is not meant to teach you Forth. You may learn Forth from one of the many available books. Once you've grasped the concept of the stack and the way of adding and removing numbers to and from the stack, you'll quickly find your way through the dictionary by experiment and a little thought.

The compiler shown here is very well suited for this purpose. The main omissions of my version from Standard Forth are:

- There are no defining words like Create and Does>, but there is no problem creating constants, variables and arrays.
- There are no double precision numbers.

The object of this article is to explain some of the functions of the compiler, particularly the — non-standard — compiler commands and some Forth words which I included to reflect the possibilities of the Spectrum. But first of all you will have to cope with the task of entering the program. Start with typing the Basic Interference given in figure 1 and save it with:

SAVE "FORTH" LINE 3

Now enter the hexloader listed in figure 2. The machine code in figure 3 may now be entered starting with address 37032. Type a whole line of nine hexadecimal numbers without spaces. The ninth number is a control code. If you made a mistake the last starting address will be shown on the screen and you may try again. Once it all has been typed in save the code with:

SAVE "CODE" CODE 37033,3666

After rewinding the tape and typing

LOAD "FORTH"

the whole system should start. You will now see the title of the program and a flashing cursor, a black square which may be considered as a disguise of the C cursor.

In alphanumerical form

As you will expect all input have to be in alphanumerical form, so a Forth word like Then should be entered by pressing four different keys. All words and numbers have to be separated by at least one space or a Return.

Inserting and deleting is done in the usual way, moving the cursor with the cursor keys and deleting with Delete. Just like in Basic the editor is at the same time ready to accept commands and new definitions, variables etc. A direct command may be one of the editor commands listed in figure 4, or a sequence of one or more Forth words or numbers. An example of an editor command is DList. Type this in and you'll see a list of all predefined Forth words.

After the execution of your command the cursor will reappear on the bottom of the screen, indicating that all is OK, as far as the computer is concerned.

I have refrained from constantly reporting OK — or fine, excellent — since such a message will soon lose its encouraging

(continued on next page)

Figure 2. Hexloader.

```
 10 REM hexloader
 20 DEF FN h(h$)=CODE h$-48-7*(h$>"9")
 30 INPUT "START ADDRESS ";s
 40 FOR n=s TO 40703 STEP 8
 50 PRINT n;
 60 LET tot=0
 70 INPUT a$
 80 IF a$="END" THEN STOP
 90 PRINT a$
 100 FOR b=0 TO 7
 110 LET z=FN h(a$(1))*16+FN h(a$(2))
 115 LET tot=tot+z
 120 POKE (n+b),z
 130 LET a$=a$(3 TO )
 140 NEXT b
 150 LET tot=tot-(INT (tot/256)*256)
 160 LET z=FN h(a$(1))*16+FN h(a$(2))
 170 IF tot<>z THEN PRINT "DATA INPUT ERROR": GO TO 50
 180 NEXT n
```

38864	36	0E	66	CD	FB	97	21	00	2A
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Figure 4. Editor commands.

LIST	— lists all word definitions. List Example will list from the word Example.
LLIST	— the listing will be sent to the printer — (also Llist Example is possible).
VLIST	— this lists all constants and variables, together with their values and memory addresses respectively; a comparison of the addresses gives you the opportunity to inspect the reserved room for arrays.
DLIST	— lists the whole dictionary.
FORGET	— clears all word definitions from the source but leaves the compiled words in trhe dictionary. Forget Example clears the word definitions from the strt of the source to the word Example inclusive.
CLEAR	— clears the stack.
EDIT EXAMPLE	— this gives the possibility to edit the word definition.
RESET	— clears the whole system and will perform a restart.
EXIT	— return to Basic, you can restart the compiler using Run — leaving all definitions etc. intact — or Run 2 — resetting everything.
SAVE NAME	— saves the source to tape — don't use quotation marks.
LOAD NAME	— loads the source and compiles it into dictionary — this may take one or two seconds; if you omit the filename, then the first file found will be loaded.

(continued from previous page)
meaning. All input will be screened by the editor, lines containing non-acceptable items — undefined words, numbers out of range — will be sent back to the screen together with an error message. The cursor will be positioned just before the unacceptable word or digit to enable you to correct your input. A list of all the error messages is given in figure 5.

The definition of a word starts with : and ends with ; don't forget the spaces.

A word may consist of several lines separated by Returns. Variables and constants are defined using Variable and Constant, e.g.

3 CONSTANT THREE

If you know anything about Forth you probably wonder how to create arrays, lacking the words Create and Does>. The point is that you have to define every array again. You need for instance an array of 20 bytes, then tyhpe.

VARIABLE INSTANCE 18 ALLOT

The operation of Variable reserves 2 bytes of Instance and 18 Allot adds another 18 bytes.

The array is defined by:

: ARRAY + ' INSTANCE + 1 ;

Now if you type 3 Array the address of the Fourth component of the array (2 bytes) will be pushed on the stack.

You may inspect the values of the defined constants and the addresses of the variables by giving the command Vlist — see also figure 4.

Editing a word is done as follows: Since there are no line or word numbers the Spectrum Edit key has been disabled, instead you have to type Edit Array and you'll find the definition back on the screen, together with the cursor, willing to accept your editing commands. If the word consists of several lines, the lines will be shown successively and you can step through the word pressing Return.

Comments may be included using (and). Returns are now allowed inside a comment. It is possible to insert machine-code in a word or a direct command. The code should start with # and has to be entered in hexa-decimal form. As an example I give the definition of the Standard Forth word 1+:

: 1+ #CD119923CDEC98

(no spaces allowed after # , in mnemonics: CALL POPSTACK, INC HL, CALL PUSHSTACK) ;

When the computer is executing a command and it does not produce the expected output — or no output at all — it is usually possible to interrupt the system by pressing Caps Shift and Break. During every loop (Do . . . Loop, Do . . . +Loop, Begin . . . Until, Begin . . . While . . . Repeat) a check is made whether Break has been pressed, and the machine will halt accordingly. If a definition does not contain any loops, but has for instance a recursive structure — which means a word calling itself, see also figure 6 — you may insert — during testing and debugging — the word Break. This word will perform the same operation as the automatic loop control.

In figure 6 I have given a few examples to illustrate the use of the compiler. In figure 7 some special Forth words are described.

Some additional information concerning the compiler — e.g. making it Microdrive compatible — I can supply if you send an envelope with your address to K. Wierstra, Hertogstraat 42, EV Arnhem, Holland. Please include £1. For £3.50 I will send you a tape of the Forth compiler. ■

Figure 5. Compiler error messages.

Integer out of range	— a number outside the range −32768 to 65535
Undefined word	— a word is not recognised.
Illegal name	— the name of a word is not available — e.g., try Variable I, I is a predefined word.
Pardon?	— given on various occasions, e.g. Save without a filename.
Out of memory	— this is just a warning, the last word will usually be entered, but memory is scarce and you should do something about it, perhaps by forgetting some words.

Runtime error messages.
Stack empty
Stack overflow
Division by zero
Break (the program has been interrupted, or an illegal command has been given e.g. 30 30 AT)

Figure 6.
Example 1.
```
: PLANE 176 0
     DO I 256 0
          DO DUP I SWAP PLOT
          LOOP DROP
     LOOP
(THIS WORD FILLS THE SCREEN WITH
PLOT) ;
```
Example 2.
```
VARIABLE N  VARIABLE F
: FAC  N @  1 >
  IF N @ 1 - N ! FAC (RECURSION)
       N @ 1 + DUP N !
       F @ * F !
ELSE 1 F !
THEN ;
: FACTORIAL ."GIVE A NUMBER <9"
  KEY 48 - N ! FAC
  CR N @ . ."! = " F @ U.
  (THESE WORDS CALCULATE THE FAC
TORIAL OF A NUMBER) ;
```
Example 3.
```
VARIABLE LINE$ 30 ALLOT
: STR! (THESE WORDS SHOW THE USE
 OF SOME STRING HANDLING WORDS)
  OVER C@ 1 + CMOVE ;
: INPUT   ."TYPE SOME LINE"
  QUERY 13 WORD
  LINE$ STR! ;
: .STR COUNT TYPE CR
  (THIS WORD PRINTS THE LINE) ;
: REVERSE COUNT 1 - -1 SWAP
  DO DUP I + C@ EMIT
  -1 +LOOP DROP
  (THE LINE WILL BE WRITTEN IN R
EVERSE ORDER) ;
: SHOW INPUT CR
  LINE$ .STR
  LINE$ REVERSE ;
```

Figure 7. Non-standard — Spectrum — Forth words.

UDG	— pushes the address of the first user-defined graphic on the stack.
CLS	— clears the screen.
10 10 BEEP	— equivalent to ZX Basic's Beep 1,10 — mind the difference between the first parameters; in Forth the duration of the beep has to be given in tithes of seconds.
10 20 PLOT	— equivalent to Plot 10,20.
3 7 AT	— equivalent to Print AT 7,3;.
RANDOM	— puts a pseudorandom number betwen 0 and 127 on the stack — you should judge the randomness yourself.
24 EMIT	— output will be sent to the printer if the screen is in use or vice versa.

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IBM BUILT THE FIRST floppy disc drives to allow its engineering and maintenance staff to exchange data and programs between mainframe computers. The first floppies were eight inches in diameter and, because it was IBM, the electronic protocol for recording data and the physical number and spacing of the tracks became a standard.

Someone thought they could pack the same amount of data on to a smaller disc and the 5.25 inch floppy was born. The number of disc drives that were being sold attracted the semiconductor manufacturers and microprocessors with built-in Rom were programmed to do nothing but record data in the right position on the disc, ready for it to be retrieved later on. It's the job of the disc filling system to act as a go-between, translating the file handling commands issued by the Machine Operating System (MOS) into as series of instructions that can be carried out by the floppy disc controller.

Disc controller knows

For example, *Cat is a MOS command. The BBC computer doesn't know how the disc controller obtains the right information — it is the disc filing system that tells the disc controller to move to track 0, wait until the index hole in the disc passes the photocell and then read the information from the disc.

The disc controller, using its very primitive built-in program, knows when it has reached track 0, when the photocell turns on, and it can separate the important data that the computer wants from the other data recorded on the disc that is there to keep.

The Intel 8271 chip was chosen by Acorn as the floppy disc controller for the BBC microcomputer. The 8271 has several desirable features, and was a perfectly sound choice at the time that the machine was designed. However, there was a delay between the formulation of the design and the launch of the machine, and between the appearance of the BBC computer and the large-scale use of floppy disc drives.

In that interval the Intel 8271 became obsolescent and expensive. Like everything else in microcomputing it is all a matter of fashion; the 8271 is a perfectly adequate chip that will control a number of disc drives to store large quantities of information.

But other companies, Western Digital in particular, have developed cheaper and more sophisticated chips. Some of these chips will record data on a floppy disc in what is known as "double density". But like all the best things in life that description is slightly larger than the reality.

Double density recording is a method of storing information on a floppy disc more compactly than is possible using single density. The two methods of recording information are quite different. Most of the Western Digital chips can cope with both single and double density recordings. The disc rotates at a constant speed regardless of which recording method is in use.

Some BBC double density disc interfaces record 18 sectors around each track on the disc while others record 16 sectors. The single density Acorn disc interface using the 8271 chip records 10 sectors.

Consequently, it is possible for a double density interface to read either 16 or 18 sectors of 256 bytes in the same time that the Acorn interface will read 10 sectors of 256 bytes. The rate of data transfer between the floppy disc and the computer is increased. Not only is the speed of transfer increased but the total storage capacity of the disc is increased by either 60 or 80 per cent.

The floppy disc interfaces reviewed in this article will store either 320K or 360K on a single sided 80-track drive where the Acorn interface will store 200K. In fact, the formatting of the disc takes up a small number of bytes and the actual storage capacity is about one 1K less than the nominal totals.

Table 1 lists some of the characteristics of five currently advertised double density disc interfaces. Three other double density interfaces are advertised — Kenda, Microware and Gnomic. A great deal of work is being done by different companies to get their disc interface on to the market ahead of their rivals. Advertisements for a particular disc interface may not reflect the actual availability of the product. I was unable to review the Merlin disc interface although it is potentially the most exciting double density interface for the BBC Micro as it combines both surfaces of a single disc into one storage area.

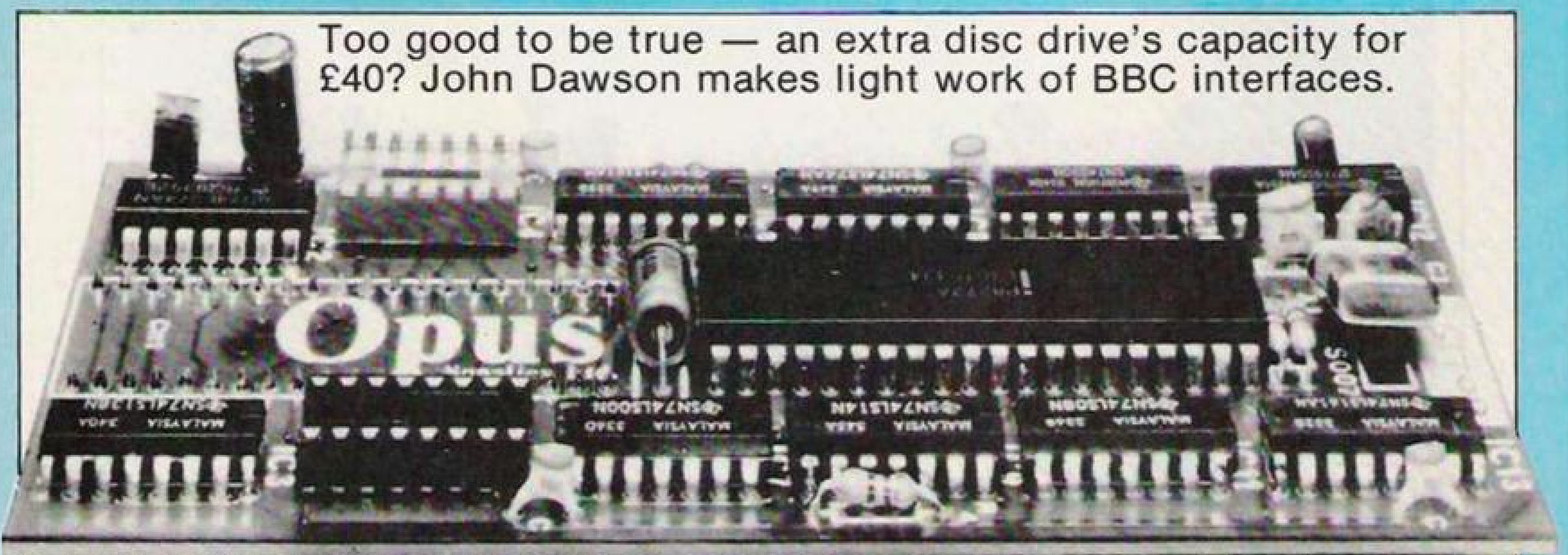
Straightforward in theory

In other words, where other products treat the second side of the disc in Drive 0 as Drive 2, the Merlin interface simply sees Drive 0 as a very large capacity drive.

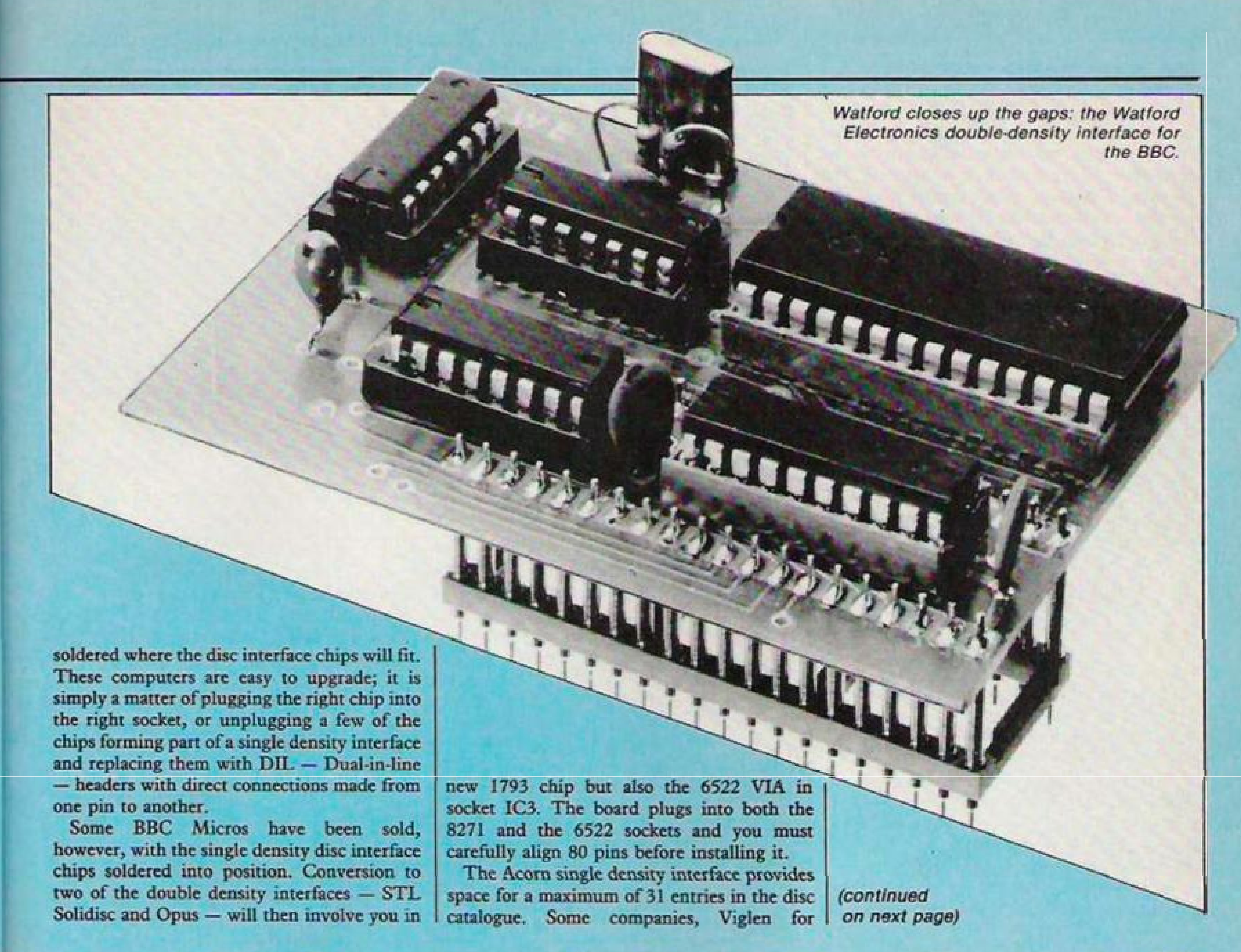
Fitting the disc interfaces is straightforward in theory but you may encounter problems with some versions of the BBC Micro. Many machines have been sold with IC sockets

DOUBLE DENSITY

Too good to be true — an extra disc drive's capacity for £40? John Dawson makes light work of BBC interfaces.



Magnum Opus: the interface Opus has designed to do the double-density job.



Watford closes up the gaps: the Watford Electronics double-density interface for the BBC.

ITY FOR THE BBC

soldered where the disc interface chips will fit. These computers are easy to upgrade; it is simply a matter of plugging the right chip into the right socket, or unplugging a few of the chips forming part of a single density interface and replacing them with DIL — Dual-in-line — headers with direct connections made from one pin to another.

Some BBC Micros have been sold, however, with the single density disc interface chips soldered into position. Conversion to two of the double density interfaces — STL Solidisc and Opus — will then involve you in the nail-biting business of unsoldering chips from the main board of the computer.

You can probably get away with short circuiting the right pins of the chips while they remain in the board, but that isn't in the instruction manuals. The Watford Electronics manual gives no fitting instructions. You are offered instead the instruction to "Take it back to whoever fitted your disc upgrade and get it done properly" if you fail to get the correct message on screen.

The LVL board is the largest of the four I examined, measuring 14.5cm by 10cm. The STL Solidisc board — the smallest — sits comfortably in the BBC Micro alongside a Sidewise Rom expansion board. None of the other interfaces — Opus, Watford, LVL — were physically compatible with the ATPL Sidewise board.

The Opus board required the removal of the A-D converter chip and two Roms before it could be plugged in, while the Watford board blocked off only the two Rom sockets. The STL, Opus and Watford systems worked successfully with the ATPL Rom board.

The LVL disc interface board has sockets for not only the old 8271 controller and the new 1793 chip but also the 6522 VIA in socket IC3. The board plugs into both the 8271 and the 6522 sockets and you must carefully align 80 pins before installing it.

The Acorn single density interface provides space for a maximum of 31 entries in the disc catalogue. Some companies, Viglen for

(continued on next page)

Table 1. Comparison of BBC double density disc interfaces.

Name	Price £	Capacity 80 tracks	Drives	Cont. disc surface	Format in Rom
Acorn SD	95.00	200K	4	NO	NO
LVL	115.00	360K	8 logical	NO	NO
Merlin	109.25	-	-	YES	-
Opus	102.95	360K	4	NO	YES
Solidisk	39.95	320K	5	NO	YES
Watford	97.00	360K	4	NO	YES

Name	Manual	Disc controller
Acorn SD	***	8271
LVL	***	FDC 1793
Merlin	-	-
Opus	****	WD 7291
Solidisk	*	WD 1770
Watford	**	Erased

Thanks to the following companies who loaned products for review:

LVL
Scientific House, Bridge Street,
Sandiacre, Nottingham NG10 5BA.
Tel: 0602 394000.

Watford Electronics,
250 High Street,
Watford,
Tel: 0923 40588.

Opus Supplies Ltd,
158 Camberwell Road,
London SE5 0EE.
Tel: 01 701 8668.

(continued from previous page)

example, has produced disc utility programs that reserve space on a disc for a second catalogue giving a total of 62 entries. The Watford Electronics single density disc filing system — this uses the 8271 controller and the company's own disc controller software in an Eprom — also provides space for 62 entries in the catalogue, albeit at the expense of non-standard coding on the disc and a slight loss of speed when saving a file.

For many purposes the standard number of catalogue entries will be sufficient but short games or individual letters tend to use up precious space in the catalogue while the disc remains half empty. Clearly this problem becomes more important when the capacity of the disc is increased by 60 or 80 per cent. Opus has increased the number of files that can be held on one disc by creating eight volumes.

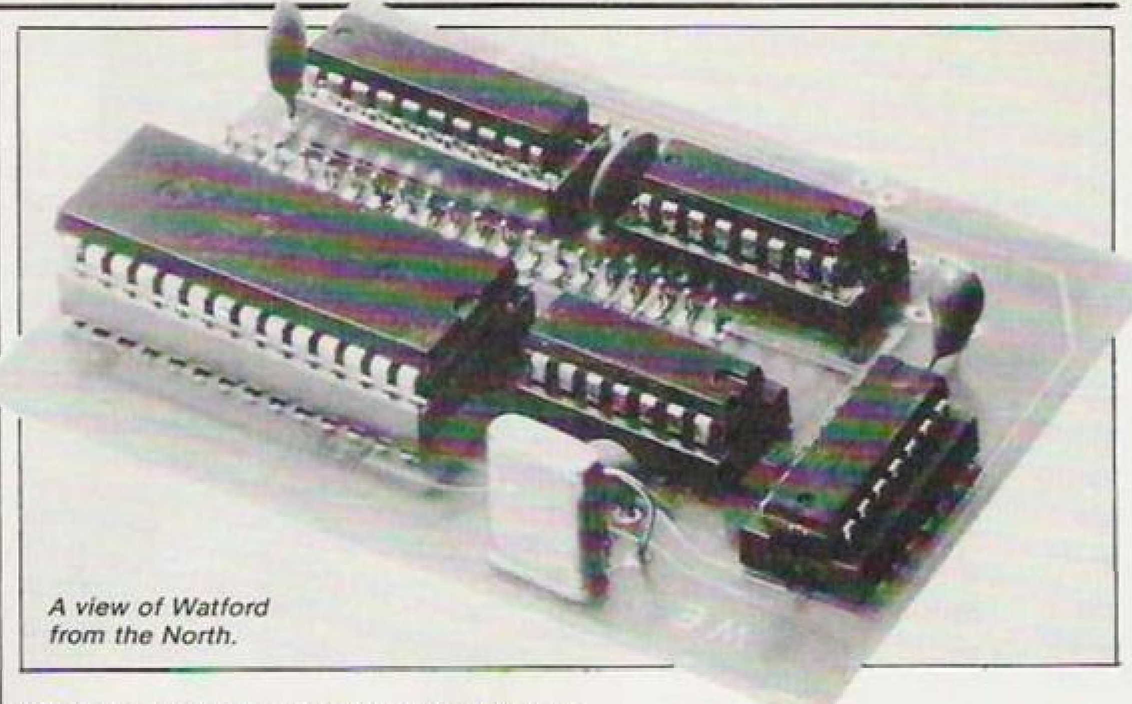
Each volume acts as a separate catalogue holding 31 files; a maximum of 248 files on one disc. Watford Electronics has carried forward the arrangement that allows you to produce a second catalogue giving a maximum of 62 files. The STL manual was clearly a pre-production version and beyond referring to "extended cataloguing" makes no mention of the number of catalogue entries that the system will handle.

Space is fixed

The LVL disc interface operates quite differently. The manual says:

- 100K drives: In double density ... You will have only one drive to access, which remains drive, 0. It can hold up to 31 different files and 180K of data storage.
- 400K drives: You have four drives to access; 0, 1, 2 and 3. There is a capacity for 124 separate files and 720K of data storage.
- 800K drives: There are eight drives numbered 0 to 7. With 80-track double density, the number of sectors exceeds the current directory limitations. To retain compatibility each disc surface is split into two logical drives. Add 4 to the normal drive number, so that logical drive 4 is the second half of drive 0, each of 720 sectors ... hence there is a total capacity of 248 separate files and 1,474,560 bytes of on-line storage if all drives are fully utilised.

The amount of space taken up by each logical drive in the LVL system is fixed in comparison to the volumes generated by the Opus system. The Opus command *Volgen allows you to change the amount of space on the disc allocated to each volume. Reallocation of space erases any existing catalogue entries so the facility is only of practical use immediately after the disc has been formatted.


A view of Watford from the North.

At present LVL provides a disc which holds programs to format and verify your own program and data discs. The system is being enhanced at present and the company is moving to 16K Eproms for the filing system. The other double density disc interfaces have format and verify routines held in the operating system Eprom — Watford and Opus use 27128 16K Eproms.

Only the Watford Electronics system explicitly states that the format program will not affect a program already in the computer's Ram. I use the Pace Toolstar chip to format discs for the Acorn single density system and it is useful to be able to get a new disc ready for use at any time, even in the middle of word processing a book chapter.

The STL Solidisk system will address four floppy disc drives numbered 0 to 3. Additionally, you can address a fifth drive (number 4) with the STLDisk DFS to save or load data to the Solidisk Sideways Ram board. Opus has a tape to disc routine in the operating system Eprom, a command which "selects the sideways Rom from which memory is saved when a *Save command is issued which requires memory from &8000 to &BFFF to be saved."

In other words you can save the contents of CMOS Ram chips occupying one of the sideways Rom sockets. The Opus system has been designed to cope as far as possible with protected discs. Two commands *4080 and *Density change the response of the system to stop the automatic identification of density and number of tracks.

Of the systems that I have seen, the Opus and LVL interfaces have the clearest documentation, although the Watford manual is the largest. The STL manual is poorly laid out and omits basic information about the disc filing system that would help new disc users in particular.

Watford manual extensive

The Watford manual is extensive and contains more information than the others although it is confusing in places because the single density manual has had additional sections dropped casually into the existing text. You must keep a close eye on the brackets to understand what you are reading.

Advertisements for the double density disc interfaces for the BBC Micro all claim some degree of compatibility with the standard Acorn single density interface. However, there is compatibility and compatibility. All the interfaces that I tried would read a straightforward single density disc formatted for the Acorn disc filing system and used to store Basic programs and View documents.

All the double density systems will check the density of the disc in a drive and alter their characteristics automatically. So you can copy a single density disc to a double density disc without trouble even using one drive. The problems arise with protected software.

The results of trying to run Viewfinder, Clares Replica II and the new Acornsoft game Elite using the various interfaces were not encouraging. The Opus system did read and Run Viewindex correctly. None of the interfaces would load Lisp or Forth from the Replica disc, and Elite baffled them all.

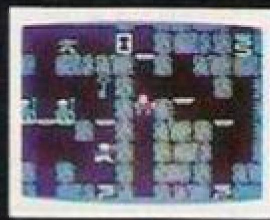
Opus says it is talking to Acorn to try to establish a standard for double density operation, and to agree how protected discs may be read by these new, non-standard disc interfaces. STL is now advertising a new system that uses the 8271 chip as well as a double density controller; presumably you can switch between the two, maybe that's the answer if you can afford or find the 8271. ■

CONCLUSIONS

- Commercial microcomputers don't make a fuss about splitting up disc surfaces, the limited numbers of catalogue entries and so on. Nobody wants to know about problems in the disc operating system when they are word processing, budgetting or preparing invoices. I don't care if a file is split up between two sides of one disc; all I want is to be able to use the data held on the disc in a drive.
- The present disc filing systems available for the BBC would be unattractive to business users because they demand too much attention and care. The Merlin system may break out of this low-level trap.
- All the interfaces work and do offer a major increase in disc capacity. If you are buying the BBC machine simply for word processing, and you don't want to use Viewfinder or, I suspect, the View Printer Drive Generator, then the cheap STL double density interfaces will serve you very well.
- If you don't really understand disc filing systems and you do want to be able to play games occasionally then you should ask yourself whether it is worth spending more money for a clearer manual and a more compatible system or whether you want increased storage capacity.
- For myself, I shall soldier on with my ageing 8271 for a little longer.

New Releases

TOM THUMB

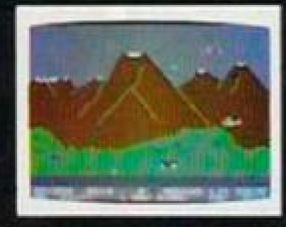
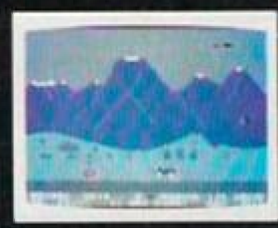
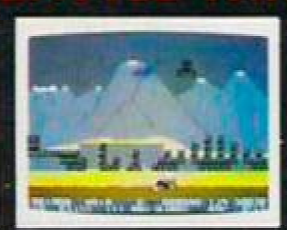
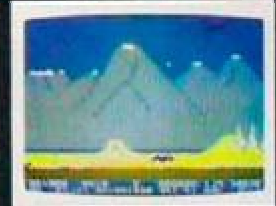




Within the scrolling mazes of the six pyramids lie the 48 keys which will unlock the secrets of the ancient Egyptians. Each maze can be viewed as a whole to help you plan your strategy and chart your way. You need superb timing to acquire the keys and fit them in the correct keyholes. The Vic 20 version also has six scrolling mazes and numerous perils to be faced as you collect the treasures in order to survive.

J.S. COMMODORE 64 VIC 20 16K £5.95

BATTLE THROUGH TIME



This non-stop action adventure takes off with World War II spitfires, jet fighters in Korea and helicopter attacks in the Vietnam war, moving on through time to the murderous weapons of World War III. The mutant offensive brings about the end of civilisation followed by the dawn of pre-historic times and the vicious pteradacktyls. Excellent graphics and sound effects bring this seven stage "Battle Through Time" to life.

J.S. COMMODORE 64 £7.95

ZAGA MISSION




A diagonally scrolling maze lies ahead of you. There are no enemy fighters or ground fire to destroy you. You have total speed control of a highly manoeuverable helicopter and it will hover while you work out your approach. Absolute concentration is essential to complete ten stages of the "Zaga Mission".

J.S. COMMODORE 64 £7.95

CATACOMBS




A sealed door bars your entry to an intriguing role playing adventure. Sequence of appropriate words swings the door open to another location. Each location is shown in superb graphics to assist you in your fight for survival. Save adventure facility.

K.B. COMMODORE 64 £7.95

P.C. FUZZ




P.C. Fuzz has nothing but his flying truncheon to capture the money being literally spirited away by the local mafia. Jostled by punks on pogo sticks and wobbled by well oiled patrons of the local inns at the closing time, he pursues the villains with vigour.

J.S. COMMODORE 64 £7.95

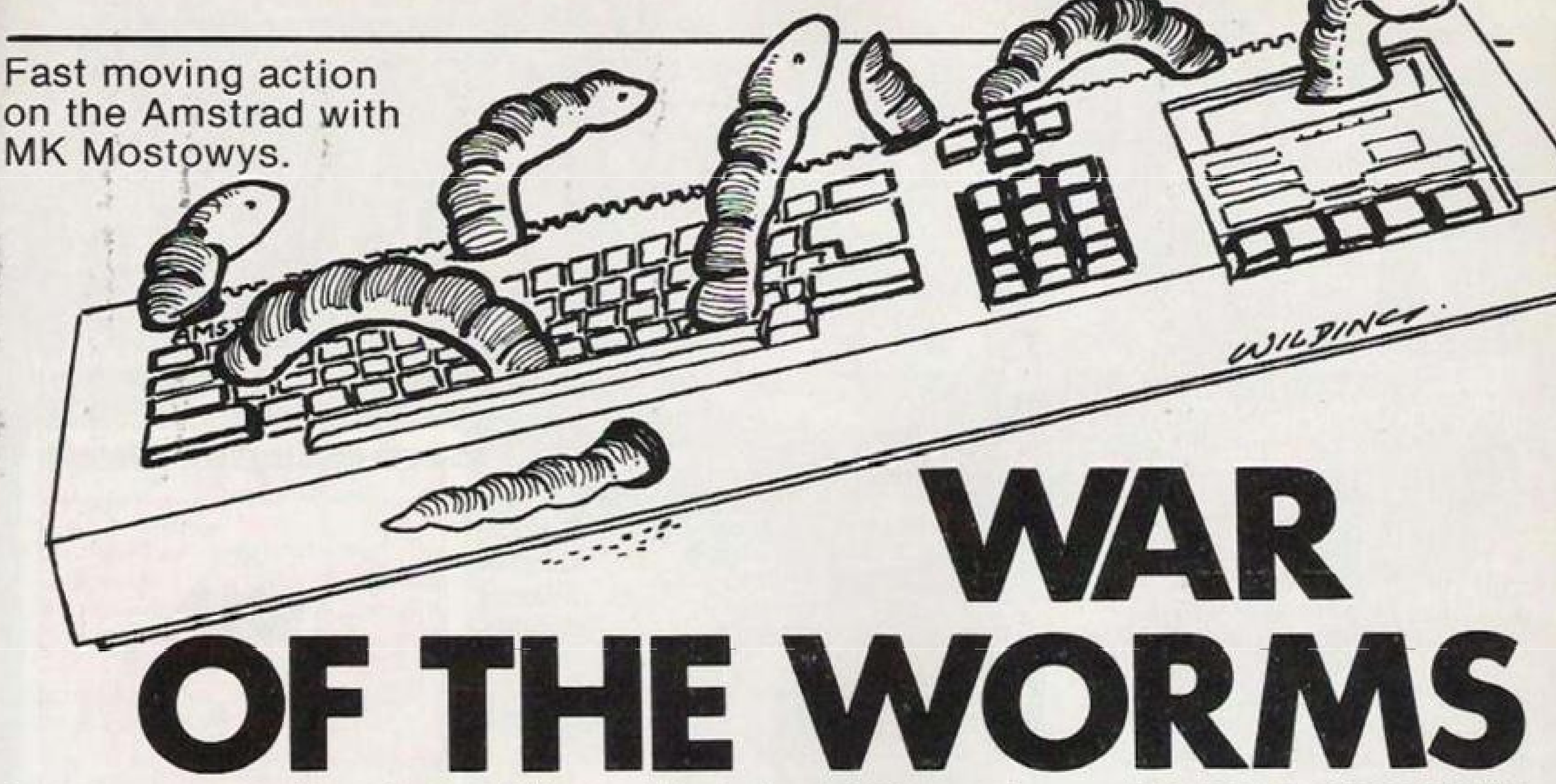


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Mail Order: 8 HIGH STREET HORLEY SURREY 24 HOUR CREDIT SALES HORLEY 02934 6083

Payment by: P.O. - ACCESS - VISA - 50p POSTAGE & PACKAGING

Fast moving action on the Amstrad with MK Mostowys.



WAR OF THE WORMS

IN THIS GAME you must guide a snake around the screen using a joystick or keys of your own choice. The object is to collect all the yellow bags of gold and, if possible, the white goblets that appear at random intervals. On no account must you try to collect a red goblet.

You are awarded 10 points for every bag collected and one hundred points for a white goblet. If you manage a high enough score you will be invited to enter it in the high score table provided.

If you ever manage to reach screen 15 and onwards things get rather difficult.

The program is reasonably short and the breakdown of lines give a good idea of how it works. The program could be shortened slightly by substituting various CHR$ references with control codes entered direct.

Do not try to run the program until you have typed in and Saved the entire program on tape. The reason being that the call BB03 statement used within the program not only flushes the keyboard buffer as required but also partially disables the Escape key as well. The only way to stop the program once it is running is to wait until you are confronted with the high score table, then ignore the two options given i.e., C to continue and O for key options, and press E instead.

60-220	Main routine. Scans keyboard or joystick. Checks for collisions. Print snake. Decides whether or not to place goblet.
230-240	Increments score and produces sound when goblet collected. Also increases tail length.
250-260	Increments score and produces sound when bag collected. Also increases tail length.
270-280	Produces sound and decrements lives when wall, snake or red goblet are hit.
290	Blanks out goblet after delay.
300-310	Places goblet of a random colour at a random position on the screen.
320-500	High score routine.
510	Decrements time scale and checks for end.
520-630	Prints screen. Line 540 prints length of wall. Line 550 prints number of columns.
640	Routine to print columns.
650-780	Gives keyboard or joystick options and allows user-defined keys.
790-820	Sets up user-defined symbols.
830	Defines three strings to print column.
850	Sets variables, envelopes, and dimension arrays for tail position.
860-960	Sets high scores.
970	Defines functions to check screen positions.

```
10 INK 1,24:INK 0,1:INK 2,20:INK 3,6
20 RANDOMIZE TIME:CALL &BB03
30 GOSUB 790
40 GOSUB 650
50 CLS:GOTO 410
60 IF INT (RND*100)>98 AND fg=1 THEN GOSUB 300
70 IF fg=0 THEN cou=cou-1:IF cou=0 THEN GOSUB 290
80 IF wi<1 THEN  SOUND 131,0,50,7,0,0,3:fred=REMAIN (1):lives=lives-1:IF lives>0 THEN 540 ELSE GOTO 320
90 LOCATE a,b:PEN 1:PRINT CHR$(240):PRINT CHR$(22);CHR$(1):LOCATE a,b:PEN 3:PRINT CHR$(241):PEN 1:PRINT CHR$(22);CHR$(0)
100 IF e>0 THEN LOCATE c(e),d(e):PRINT " "
110 IF e>100 THEN e=0
120 e=e+1
130 IF f>100 THEN f=0
140 f=f+1:c(f)=a:d(f)=b
150 a$=UPPER$(INKEY$):IF a$="" THEN a$=z$
160 IF a$=L$ THEN t=FN tl:Z$=L$:A=A-1:GOTO 210
170 IF a$=R$ THEN t=FN tr:Z$=R$:A=A+1:GOTO 210
180 IF a$=U$ THEN t=FN tu:Z$=U$:B=B-1:GOTO 210
190 IF a$=D$ THEN t=FN td:Z$=D$:B=B+1:GOTO 210
200 GOTO 60
210 IF t=0 GOTO 60 ELSE ON t GOSUB 230,250,270
220 ON ff GOTO 540,320,60
230 IF t=1 THEN fgl=0:SOUND 4,0,10,5,0,0,0:FOR n=1 TO 3:f=f+1:IF f>101 THEN f=1
240 c(f)=a:d(f)=b:NEXT:sc=sc+100:LOCATE #1,10,1:PRINT#1,USING"######";sc:ff=3:RETURN
250 IF t=2 THEN SOUND 4,0,10,5,0,0,0:FOR n=1 TO 3:f=f+1:IF f>101 THEN f=1
260 c(f)=a:d(f)=b:NEXT:sc=sc+10:LOCATE #1,10,1:PRINT#1,USING"######";sc:MEN=MEN+1:IF MEN=20 THEN SH=SH+1:fred=REMAIN (1):ff=1:RETURN ELSE ff=3:RETURN
270 IF t=3 THEN SOUND 131,0,50,7,0,0,3:fred=REMAIN (1):lives=lives-1:IF lives>0 THEN ff=1 ELSE ff=2
280 RETURN
290 fg=1:IF fgl=1 THEN LOCATE aal,bbl:PRINT" ":RETURN ELSE RETURN
300 aal=INT (RND*37)+2:bbl=INT(RND*18)+2:IF FN CH=2 OR FN CH=3 THEN RETURN ELSE SOUND 1,30,0,0,1:LOCATE aal,bbl:IF RND<0.5 THEN PEN 1 ELSE PEN 3
310 PRINT CHR$(245):fg=0:fgl=1:cou=100:RETURN
320 MODE 0:IF sc>VAL(MID$(a$(1),13)) THEN PEN 13:PRINT "YOUR SCORE IS IN THE";TAB(7);CHR$(10);"TOP  TEN" ELSE GOTO 410
330 LOCATE 6,6:PEN 13:PRINT"YOUR NAME?";CHR$(10);TAB(3)"(Max 10 letters)":LOCATE 6,10:PRINT STRING$(13," ");:LOCATE 6,10:CALL &BB03:INPUT "",n$:n$=UPPER$(n$)
340 IF LEN(n$)>10 OR LEN(N$) <1 THEN 330
350 CHECK=10
360 WHILE sc<VAL(MID$(a$(check),13))
370 CHECK=CHECK-1
380 WEND
390 IF CHECK>1 THEN FOR N=1 TO CHECK-1:A$(N)=A$(N+1):NEXT
400 A$(CHECK)=N$+STRING$(11-(LEN(N$))+(7-LEN(STR$(SC))),"  ")+STR$(SC)
410 CLS:PEN 15:PRINT TAB(5)"HIGH  SCORES";CHR$(10):FOR N=10 TO 1 STEP -1
420 PEN INT(RND*4)+1:PRINT TAB(2) A$(N);CHR$(10);
430 NEXT
440 CALL &BB03
450 LOCATE 1,24:PEN 12:PRINT"PRESS ";:PEN 11:PRINT"C ";:PEN 12:PRINT"TO CONTINUE":LOCATE 1,25:PRINT"OR ";:PEN 11:PRINT"O ";:PEN 12:PRINT"FOR KEY OPTIONS";
460 sc=0:sh=0:lives=3
470 IF INKEY(62)<>-1 GOTO 520
480 IF INKEY(34)<>-1 THEN GOSUB 650:CLS:GOTO 410
490 IF INKEY(58)<>-1 THEN INK 0,13:INK 1,0:PAPER 0:PEN 1:BORDER 13:MODE 2:LIST
500 GOTO 470
510 DI:wi=wi-1:PLOT wi,4,1:DRAWR 0,0,1:IF wi=100 THEN SOUND 2,150,0,0,2:EI:RETURN ELSE EI:RETURN
520 INK 2,0:INK 0,0:INK 1,0:INK 3,0:BORDER 0:PAPER 0:MODE 1:WINDOW 1,40,1,21:WINDOW #1,1,40,23,23:WINDOW#2,2,39,2,20:PAPER #1,0
530 CLS:PEN 3:PAPER 0:FOR n=2 TO 20:LOCATE 1,n:PRINT CHR$(254);:LOCATE 40,n:PRINT CHR$(247);:NEXT:LOCATE 1,1:PRINT CHR$(249);STRING$(38,CHR$(248));CHR$(250);:LOCATE 1,21:PRINT CHR$(251);STRING$(38,CHR$(253));CHR$(252);
540 INK 2,0:INK 0,0:INK 1,0:INK 3,0:CLS#2:PEN 3:PAPER 1:LOCATE 2,6:PRINT STRING$((SH MOD 6)*4,CHR$(244));:LOCATE 40-((SH MOD 6)*4),15:PRINT STRING$((SH MOD 6)*4,CHR$(244))
550 IF sh>5 THEN PEN 3:PAPER 0:LOCATE 30,2:GOSUB 640:LOCATE 10,15:GOSUB 640:IF sh>11 THEN LOCATE 35,2:GOSUB 640:LOCATE 5,15:GOSUB 640:IF sh>17 THEN LOCATE 25,2:GOSUB 640:LOCATE 15,15:GOSUB 640
560 PAPER 0:LOCATE 10,5:PEN 1:PRINT CHR$(240):PRINT CHR$(22)+CHR$(1):LOCATE 10,5:PEN 3:PRINT CHR$(241)
570 FOR v=1 TO 20
580 aal=INT (RND*37)+2:bbl=INT(RND*18)+2:IF FN CH=2 OR FN CH=3 GOTO 580
590 LOCATE aal,bbl:PEN 2:PRINT CHR$(242):LOCATE aal,bbl:PEN 3:PRINT CHR$(243):NEXT:PRINT CHR$(22)+CHR$(0):ORIGIN 0,0,0,100,12,4:CLG 3:ORIGIN 0,0,101,640,12,4:CLG 2:ORIGIN 0,0,0,640,400,0
600 PEN#1,1:CLS #1:PRINT#1,TAB(4)"SCORE":LOCATE #1,10,1:PRINT#1,USING "######";sc;:LOCATE#1,30,1:PRINT#1,"LIVES ";lives:INK 2,24:INK 0,0:INK 1,26:INK 3,6
610 MEN=0:Z=0:Z$="":e=0:f=0:a=10:b=5:c(1)=10:d(1)=5:fg=1:wi=639:EVERY 4,1 GOSUB 510
620 CALL &BB03
630 GOTO 60
640 PRINT c11$;:PRINT c12$;:PRINT c12$;:PRINT c12$;:PRINT c12$;:PRINT c13$:RETURN
650 MODE 0:PAPER 13:CLS:BORDER 22:PEN 5:LOCATE 7,6:PRINT"KEYBOARD":PRINT:PRINT TAB(10)"OR":PRINT:PRINT TAB(7)"JOYSTICK":PRINT:PRINT TAB(8)"(K...J)"
660 CALL &BB03
670 IF INKEY(37)<>-1 THEN du$=INKEY$:GOTO 700
680 IF INKEY(45)<>-1 THEN l$=CHR$(8):r$=CHR$(9):u$=CHR$(11):d$=CHR$(10):GOTO 780
690 GOTO 670
700 CLS:PEN 6:PRINT "DEFINE YOUR OWN KEYS":PRINT TAB(5)"AS  PROMPTED":PEN 5:LOCATE 7,7:PRINT"LEFT: ";:CALL &BB03
710 L$=UPPER$(INKEY$):IF L$="" GOTO 710 ELSE PRINT L$
720 PEN 7:LOCATE 6,9:PRINT"RIGHT: ";:CALL &BB03
730 R$=UPPER$(INKEY$):IF R$="" OR R$=l$ GOTO 730 ELSE PRINT R$
740 PEN 3:LOCATE 9,11:PRINT"UP: ";:CALL &BB03
750 U$=UPPER$(INKEY$):IF U$="" OR u$=l$ OR u$=r$ GOTO 750 ELSE PRINT U$
760 PEN 8:LOCATE 7,13:PRINT"DOWN: ";:CALL &BB03
770 D$=UPPER$(INKEY$):IF D$="" OR d$=l$ OR d$=r$ OR d$=u$ GOTO 770 ELSE PRINT D$
780 FOR n=1 TO 200:NEXT:INK 0,0:INK 1,24:BORDER 0:PAPER 0:RETURN
790 SYMBOL AFTER 199:SYMBOL 200,255,192,127,63,26,26,26,26:SYMBOL 201,255,3,254,252,88,88,88,88:SYMBOL 202,26,26,26,26,63,127,192,255:SYMBOL 203,88,88,88,88,252,254,3,255:SYMBOL 204,26,26,26,26,26,26,26,26:SYMBOL 205,88,88,88,88,88,88,88,88
800 SYMBOL 249,255,180,205,182,157,218,172,187:SYMBOL 250,255,37,203,107,213,95,169,149:SYMBOL 251,169,149,250,171,221,211,164,255:SYMBOL 252,221,53,75,165,180,179,45,255:SYMBOL 253,0,40,182,218,89,213,117,255
810 SYMBOL 254,148,252,190,240,154,220,140,240:SYMBOL 248,255,117,213,89,218,182,40,0:SYMBOL 247,21,63,99,31,89,39,49,15:SYMBOL 242,0,126,24,60,126,126,126,60:SYMBOL 243,0,0,29,2,0,0,0,0
820 SYMBOL 240,0,24,60,102,102,60,24,0:SYMBOL 241,0,0,0,24,24,0,0,0:SYMBOL 244,238,238,0,187,187,0,238,238:SYMBOL 245,126,126,126,126,60,24,24,126:SYMBOL 246,0,42,84,42,0,0,0,0
830 c11$=CHR$(200)+CHR$(201)+CHR$(8)+CHR$(8)+CHR$(10):c12$=CHR$(204)+CHR$(205)+CHR$(8)+CHR$(8)+CHR$(10):c13$=CHR$(202)+CHR$(203)
840 REM
850 DEFINT a-r,t-z:DIM c(101),d(101):SC=0:sh=0:lives=3:ENV 2,127,6,1:ENV 1,1,15,1,14,-1,5,5,0,1
860 DIM A$(10)
870 a$(10)="MOSSOFT       5000"
880 a$(9)="WILLY WHO?    4500"
890 a$(8)="SPRIG         4000"
900 a$(7)="SPROG         3500"
910 a$(6)="MR TRAIN      3000"
920 a$(5)="ARNOLD        2500"
930 a$(4)="PSYCHO        2000"
940 a$(3)="STAN STILL    1500"
950 a$(2)="CHAS WHAT?    1000"
960 a$(1)="LITTLE SID     500"
970 DEF FN tr=TEST ((a*16)+7,((25-b)*16)-8):DEF FN tl=TEST ((a*16)-25,((25-b)*16)-8):DEF FN tu=TEST ((a*16)-9,((25-b)*16)+24):DEF FN td=TEST ((a*16)-9,((25-b)*16)-8):DEF FN CH=TEST ((aal*16)-7,((25-bbl)*16)-8)
980 RETURN
```

SONY MSX HIT BIT

Competition RESULTS

IF THE NUMBER of entries for our competitions is anything to go by MSX would seem to be on course for success. November's competition to win a Sony MSX Hit Bit drew one of the largest responses ever, with almost 2000 entries.

You were asked to put five of the computer's features in order of importance, and then tell us what you would connect it up to, what you would use it for and what you would call it. Software compatibility is obviously the machine's most significant feature, and was the one most people gave priority to. Without it MSX computers would probably be seen in the same light as many earlier micros from the Fast East — well constructed but rather dull.

Our panel went on to place MSX Basic in second place. Calling it powerful may be excessive but it is certainly a highly competent version of Microsoft Basic, more powerful, at least, than Sinclair Basic. Our final list was as follows:

1. MSX software compatibility.
2. Powerful MSX Basic.
3. Professional keyboard.
4. Built-in electronic diary, address book and memo pad.
5. Nifty Sony styling.

With five features to put in order there are only 120 different combinations, so quite a few people came up with the same preference as our panel. Of these we chose the entry from B. Mason, "Highlands", Bromsash, Ross-on-Wye, Herefordshire, as the winner. He suggested that he would connect the Hit Bit up to a baby alarm and bottle heater which would prepare the baby's feed on demand. What would he call it? — the Sony Tit-Bit.

Compared to some of the other suggestions this was relatively practical. Although what babies will think of this development is anybody's guess.

Feeding, in fact, was one of the most popular themes among the tiebreakers. J. Draper wanted to connect up to a cat food dispenser. Naturally, he would call it the Kit Bit. Cocktail makers, cookers, and Teasmaids were also common. The other entries covered almost every conceivable appliance: central heating systems, knitting machines, dishwashers, fish aquariums, terrapin aquariums,



car tuning kits, burglar alarms, electric toothbrushes, laser discs, video recorders, model railways, robots, soil monitoring devices for the garden, electric blankets, light switches, jacuzzi controls, neck massagers, milking machines, hi-fi systems, and the front door bell — you name it, someone wants to connect up to it.

Whether it is feasible or desirable to link up a computer to these items is open to doubt. It came as a refreshing change to read D. Sewell's tiebreaker. He suggested connecting the Hit Bit to a cardboard box. As to what he would use it for, he confessed he had not the faintest idea.

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Just plug this Interface into your 'ANALOGUE-IN' port and you can now use any standard 'ATARI-TYPE' Joystick including Quickshot II Joystick.



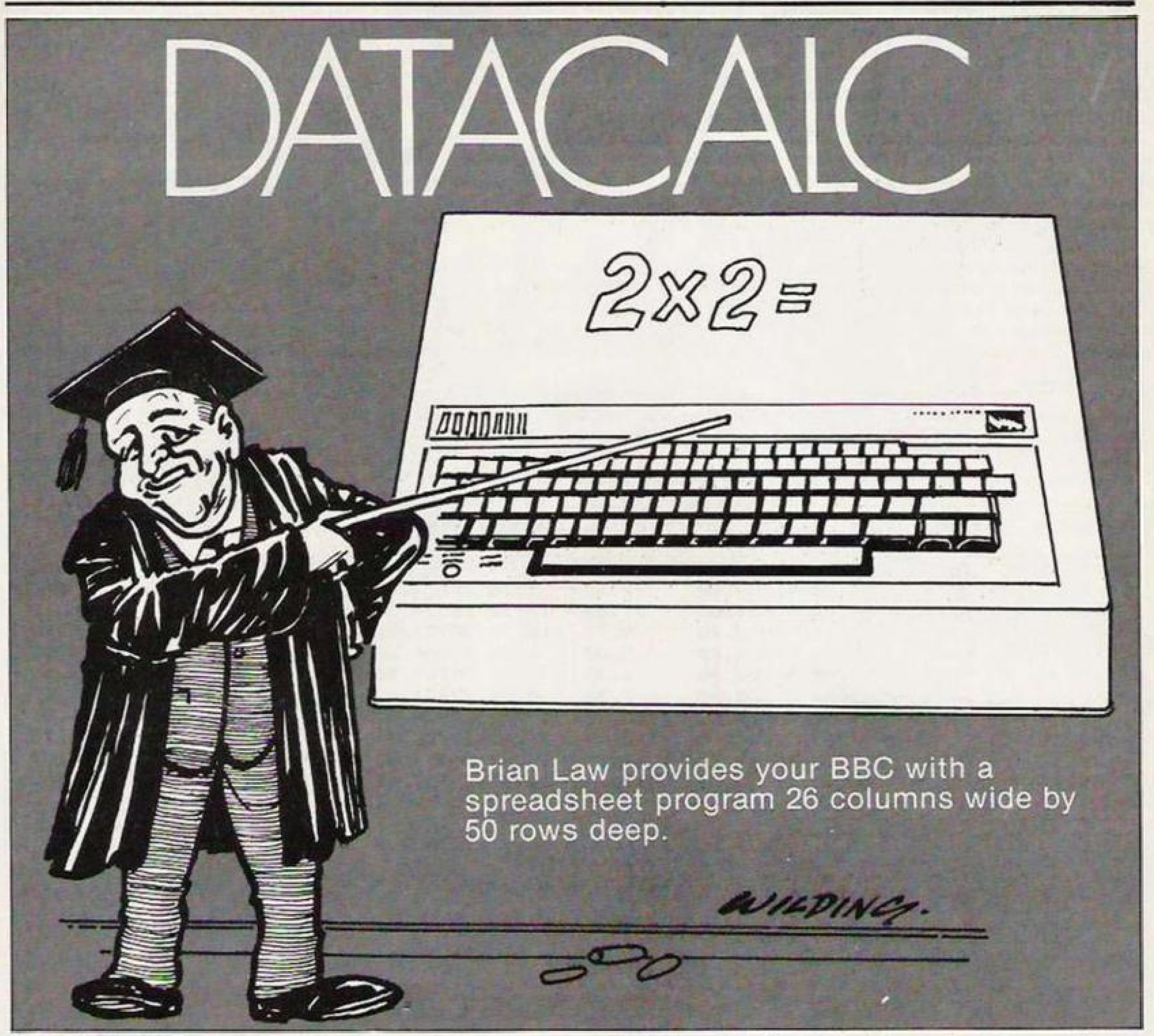






Protek Computing Ltd, 1A Young Square, Brucefield Industrial Park, Livingston, West Lothian. 0506 415353. Telex No. 727559

DATACALC



Brian Law provides your BBC with a spreadsheet program 26 columns wide by 50 rows deep.

DATACALC IS A simple to use spreadsheet program for the BBC Model B. In operation it will give you a worksheet that is 26 columns wide and 50 rows deep — if the DFS is not fitted then this can be increased up to 70 rows. In a standard spreadsheet program you can enter either data, text or a formula into any cell on the spreadsheet, Formulae can usually be extended in any direction and contain either relative or absolute values.

This versatility carries a price in the form of the complexity of entering formulae and also the lack of certain fundamental functions. Datacalc aims to overcome these problems by allowing only one formula to be entered for each column, this formula then applies to each operative row within that column.

Because of this simplification in the design of the program structure it has been possible to incorporate such functions as the summing of all values in a column and sorting values into ascending order.

When loaded using

Chain "DATACALC"

or

Chain ""

a short menu of three items is presented. Entering 2 when first loading the program will give you a clean worksheet. Entering 1 will return you to the existing worksheet if it already exists, otherwise it does nothing. Entering 3 allows you to load previously stored data.

If you enter 2 then a clean worksheet will be printed on the screen, the rows are numbered from 1 to 9 down the left hand side of the screen, and the columns are numbered from K1 to K4 along the top. The small v in the top left hand corner shows the direction in which the cursor will move after the data or text have been entered.

The direction can be altered by using function key F0. The number at the top right is the number of decimal places that will be used in the calculation and display. This can be changed betweeon 0 and 3 using the function key F7.

The dotted line at location K1, 1 is the cursor and is controlled by using the normal cursor keys. When the cursor hits the edge of the screen it will move the sheet along by either 1 row or 1 column.

To demonstrate a typical use for the program, the example shown above is for a small factory producing 12 items and is set up to calculate the profit made by each item and the total profit.

The way in which this example was entered is as follows:

Use the function keys to have the 'direction of cursor after entry pointer' pointing down, and the number of decimal places set to 2. Move the cursor down to position K1, 1 and type in "PRODUCT" followed by Return. You will have noticed two things at this stage. First, the word Product was printed in the top left hand corner as you typed it in, this will always happen and gives you the opportunity to correct any mistakes.

Secondly, the cursor moves down one row ready to accept the next entry. In this case the next entry is the underline symbol, there is no need to count an exact eight symbols, just keep the key depressed until you look to have sufficient, the computer will knock off any extra ones. Carry on down the column entering the product numbers until you reach row 14 and then move the cursor back to position K2, 1. You can now repeat the previous process for columns K2 and K3.

(continued on next page)

(continued from previous page)

Column 4 is somewhat easier to enter because it only requires a formula. T/Over is of course Volume X Price, so what we want to do is to multiply each value in column two, by its corresponding value in column 3. All we do therefore is to ensure the cursor is somewhere in column 4 then press F1 to indicate a formula is to be entered and then enter "K2*K1" followed by return.

The word calculating will start flashing in the top left corner followed by the printing of the results down to column 4. To obtain the total Turnover we need to add together all the values in column 4, this is done for you if you place the cursor in column 4 then press F2. The result is printed at the bottom of the column, below the dotted line. Now enter columns 5 and 6 as columns 2 and 3 were entered.

Column 7 requires another formula, this time we have a lump sum of overheads that has to be apportioned over all of the products, this can be done in many ways, and in fact the spreadsheet is the ideal way to find out the effect on profits by apportioning overheads in different ways.

In this instance we will apportion the overheads relation to turnover i.e. Total overhead × Turnover/Total Turnover or in Datacalc terms 300,000 × K4/S4 NB! The S4 signifies that the sum value of column 4 is to be used.

Column 8 is for total costs i.e. Overheads + (Material + Labour) * Volume or K7 + (K5 + K6) × K2. Column 9 is for profit i.e. Turnover − T/Costs or K4 − K7. Column 10 is for profit % i.e. Profit / T/Over * 100 or K9/K4 × 100.

The spreadhseet only really comes into its own at this point because you can now go back and change anything you wish and have the whole sheet recalculated for the new values.

For example move the cursor to column 2



and change the value in row 3 to 3000. Now press F1 and the whole shset will be recalculated. A more powerful example is to reduce all the values in column 2 by 10 percent to see the effect on profits.

Move the cursor to column 2 enter F1 for formula then enter K2 × .9. This will multiply all existing values in the column by

(continued on page 128)

PRODUCT	VOLUME	PRICE	T/OVER	MATERIAL	LABOUR	OVERHEAD	T/COSTS	PROFIT	PROFIT%
KB123	2000	34.00	68000.00	8.06	10.78	21783.24	59463.24	8536.76	12.55
KB124	2500	32.00	80000.00	7.45	9.36	25627.34	67652.34	12347.66	15.43
KB125	1800	46.00	82800.00	11.62	13.12	26524.29	71056.29	11743.71	14.18
KB126	2300	35.00	80500.00	9.74	10.78	25787.51	72983.51	7516.49	9.34
KB127	4000	18.00	72000.00	5.08	6.56	23064.60	69624.60	2375.40	3.30
KB128	3500	23.00	80500.00	6.45	7.86	25787.51	75872.51	4627.49	5.75
KB129	2000	35.00	70000.00	7.34	8.76	22423.92	54623.92	15376.08	21.97
KB130	1500	56.00	84000.00	13.98	15.65	26908.70	71353.70	12646.30	15.06
KB131	1800	47.00	84600.00	12.49	13.45	27100.91	73792.91	10807.09	12.77
KB132	1200	63.00	75600.00	17.56	19.67	24217.83	68893.83	6706.17	8.87
KB133	1500	54.00	81000.00	14.73	16.87	25947.68	73347.68	7652.32	9.45
			936500.0			300000.0		108108.9	

```
10REM::DATACALC:::::
11*FX21,0
12P$=CHR$(118)+CHR$(221)+CHR$(222)+CHR$(219)+CHR$(4
3)
13@%=&10
15*TV255
16MODE7
17*KEY0 '
18*KEY1 #
19*KEY2 )
20*KEY3 *
21*KEY4 $
22*KEY5 &
23*KEY6
24*KEY7 =
25*KEY8 (
26*KEY9 @
28CC=0:PD=0:C=1:K=1:HL=1:M=1:KP=1:DP=1:ONERRORGOTO1
0
30PRINTTAB(13,2);CHR$141;CHR$130;"DATACALC"
40PRINTTAB(13,3);CHR$141;CHR$130;"DATACALC"
50PRINTTAB(2,7);CHR$129;"1)";CHR$135;"RETURN TO WOR
KSHEET"
60PRINTTAB(2,9);CHR$129;"2)";CHR$135;"CLEAN WORKSHE
ET"
65PRINTTAB(2,11);CHR$129;"3)";CHR$135;"LOAD DATA FR
OM TAPE"
67X$=GET$
70IF X$<>"2" AND X$<>"3" THEN CLS:PROCPRINT_SHEET:S
OUND1,-5,75,3:SOUND1,-7,65,5:GOTO500
75IF X$="3" THEN GOTO 5200
80CLS
90CLEAR
95CC=0:PD=0:C=1:K=1:HL=1:M=1:KP=1:P$="[illegible]"
100 N1=50:N=N1+1:L=9:J=L:N2=0:C1=26:LAST=0:CN2=0:DP=
0
120DIMF$(N):DIMA$(C1)
140
150
160REM LOAD COLUMN NUMBERS
170FOR XX=1 TO C1
180X$="__K"+STR$ EVAL"(XX)"+STRING$(4- LEN STR$ EVA
L"(XX)","_")+" "
190C$=C$+X$
200NEXT
220
230
240REM LOAD MAIN STRINGS
250REM
260 FOR R=1 TO N
270X$=STR$ EVAL "R"
280F$(R)=X$+STRING$(3-LENX$," ")+STRING$(C1,"
")
330NEXT
340PROCPRINT_SHEET
350SOUND1,-5,75,3:SOUND1,-7,65,5
360
500REM CURSOR CONTROL
505PROCDIRECTION_OF_CURSOR_AFTER_ENTRY
507PROCDECIMAL_PLACE_CHANGE
510VDU23,1,0;0;0;0;
520*FX4,1
530C=3:R=5
535REPEAT
537ONERRORGOTO10
540X=C:Y=R
550IF INKEY(-122) THEN C=C+9:IF C>30 THEN C=30
560IF INKEY(-26) THEN C=C-9:IF C<3 THEN C=3
570IF INKEY(-42) THEN R=R+2:IF R>21 THEN R=21
580IF INKEY(-58) THEN R=R-2:IF R<5 THEN R=5
590PRINTTAB(X,Y);STRING$(8," ");PRINTTAB(C,R);STRING
$(8,"_")
595IF X=C AND Y=R AND KP>135 AND KP<140THEN PROCCURS
OR_MOVES_WINDOW
610KP=GET
620IF KP<136 OR KP>139 THEN PROCCOMMAND_DISTRIBUTION
:SOUND1,-5,75,3
630UNTIL K=0
639
649
650DEF PROCCURSOR_MOVES_WINDOW
655X=C:Y=R
660*FX21,0
670IF X=C AND INKEY(-122) AND K<C1-3 THEN K=K+1
680IF X=C AND INKEY(-26) AND K>1 THEN K=K-1
690IF Y=R AND INKEY(-42) AND M<N1-L+1 THEN M=M+1
700IF Y=R AND INKEY(-58) AND M>1 THEN M=M-1
710PROCPRINT_SHEET
720ENDPROC
798
799
800DEF PROCCOMMAND_DISTRIBUTION
805*FX21,0
810IF KP=33 THEN PROCDIRECTION_OF_CURSOR_AFTER_ENTRY
815IF KP=61 THEN PROCDECIMAL_PLACE_CHANGE
820IF KP=13 OR KP>47 AND KP<58 OR KP>64 AND KP<123 T
HEN PROCENTER_A_VALUE
825IF KP=123 THEN PROCPRINTER
830IF KP=35 THEN GOSUB1600
835IF KP=64 THEN PROCSAVE
840IF KP=125 THEN PROCSUM_A_COLUMN
850IF KP=36 THEN GOSUB2500
860IF KP=37 THEN PROCSORT:PROCPRINT_SHEET
870IF KP=38 THEN PROCOVER_PRINT_LABELS
880IF KP=39 THEN PROCJUMP:PROCPRINT_SHEET
885PRINTTAB(0,0)">";SPC 37
890ENDPROC
998
999
1000DEF PROCPRINT_SHEET
1020PRINTTAB(3,2)MID$(X$,K*9-8,35)
1022LOCAL R
1025X=2
1030FOR R=M TO M+8
1035X=X+2
1040PRINTTAB(0,X)MID$(F$(R),1,3);MID$(F$(R),K*9-5,35)
1050NEXT
1052IF OP=0 THEN PROCOVER_PRINT_LABELS
1055PRINTTAB(0,22)STRING$(38,"_")
1060PRINTTAB(5,23)MID$(F$(N),K*9-5,35)
1070ENDPROC
1098
1099
1100DEF PROCENTER_A_VALUE
1110LAST=1:PROCFIND_CELL_IN_STRING
1120IF KP=13 THEN X$="        ":GOTO 1160 ELSE X$=""
1130REPEAT
1140IF KP=127 THEN X$=LEFT$(X$,LEN X$-1) ELSE X$=X$+C
HR$KP
1145PRINTTAB(0,0);">";X$;SPC(38-LENX$)
1148KP=GET
1150UNTIL KP=13
1160X$=LEFT$(X$,8):X$=STRING$(8-LENX$," ")+X$
1170F$(R)=LEFT$(F$(R),FP)+X$+RIGHT$(F$(R),LEN F$(
R)-(FP+8))
1180PRINTTAB(C,R-1);X$;TAB(1,0)SPC(38)
1190IF MID$(F$(N),FP+1,8)<>"        " THEN PROCSUM_A
_COLUMN
1195PROCMOVE_CURSOR_AFTER_ENTRY:ENDPROC
1198
1199
1200DEF PROCMOVE_CURSOR_AFTER_ENTRY
1210X=C:Y=R:IF R=5 AND PD=3 OR R=21 AND PD=1 OR C=3 A
ND PD=4 OR C=30 AND PD=2 THEN PROCMOVE_WINDOW_WITH_CUR
SOR:ENDPROC
1220IF PD=1 THEN R=R+2:IF R>21 THEN R=21
1230IF PD=2 THEN C=C+9:IF C>30 THEN C=30
1240IF PD=3 THEN R=R-2:IF R<5 THEN R=5
1250IF PD=4 THEN C=C-9:IF C<3 THEN C=3
1260PRINTTAB(X,Y);STRING$(8," ");PRINTTAB(C,R);STRING
$(8,"_")
1270ENDPROC
1280
1290
1300DEF PROCMOVE_WINDOW_WITH_CURSOR
1310IF PD=1 AND R=21 AND M<N1-L+1 THEN M=M+1
1320IF PD=2 AND C=30 AND K<C1-3 THEN K=K+1
1330IF PD=3 AND R=5 AND M>1 THEN M=M-1
1340IF PD=4 AND C=3 AND K>1 THEN K=K-1
1350PROCPRINT_SHEET
1360ENDPROC
1598
1599
1600REM ::::::::::FORMULA ENTRY::::::
1610PROCFIND_CELL_IN_STRING
1615N2=R
1620PRINTTAB(0,0);CHR$130;"#";
1630INPUT"" A$(CN)
1640GOSUB 1700
1642PRINTTAB(0,0);STRING$(39," ");PRINTTAB(0,0)CHR$13
0;CHR$136;"CALCULATING"
1645HL=1
1650FOR R=HL TO N2
1652IF ASC MID$(F$(R),FP+8,1)>57 OR ASC MID$(F$(R),FP
+8,1)>32 AND ASC MID$(F$(R),FP+8,1)<46 THEN GOTO1690
1655ON ERROR GOTO 9000
1660S1=EVAL A$(CN)*10^DP+.5:X$=STR$(S1/10^DP):X$=LEFT
$(X$,8):X$=STRING$(8-LENX$," ")+X$
1680F$(R)=LEFT$(F$(R),FP)+X$+RIGHT$(F$(R),LEN F$(R)-(
FP+8))
1690NEXT
1692R=N2
1695PROCPRINT_SHEET
1696PRINTTAB(0,0)">";SPC 37
1697RETURN
1698
1699
1700REM::::::::::::::FORMULA ENCODE::::::::::::::::
1710X=1:A=LEN A$(CN):B$=A$(CN):C$=""
1720IF X>A THEN A$(CN)=C$:RETURN
1730IF MID$(B$,X,1)<>"K" AND MID$(B$,X,1)<>"S" THEN C
$=C$+MID$(B$,X,1):X=X+1:GOTO 1720
1740IF MID$(B$,X,1)<>"K" THEN X$="N" ELSE X$="R"
1745SUB$=MID$(B$,X+2,1)
1750IF SUB$=")" OR SUB$="+" OR SUB$="-" OR SUB$="*" O
R SUB$="/" OR SUB$="^" OR SUB$="" THENF=EVAL MID$(B$,X
+1,1)*9-5:C$=C$+"EVAL MID$(F$("+X$+"),"+STR$EVAL"(F)"+
",8)":X=X+2:GOTO 1720
1760F=EVAL MID$(B$,X+1,2)*9-5
1770C$=C$+"EVAL MID$(F$("+X$+"),"+STR$ VAL"F"+",8)"
1780X=X+3:GOTO 1720
1998
1999
2000DEF PROCSUM_A_COLUMN
2010IFKP<>36 THEN PROCFIND_CELL_IN_STRING:PRINTTAB(0,
0)CHR$130;CHR$136;"SUMMING"
2020LOCAL R
2030S1=0
2040FOR R=1 TO N2
2042IF ASC MID$(F$(R),FP+8,1)>57 OR ASC MID$(F$(R),FP
+8,1)<46 THEN GOTO 2055
2045S$=MID$(F$(R),FP+1,8)
2050S1=S1+EVAL(S$)*10^DP+.5
```

(continued on next page)



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(continued from page 126)

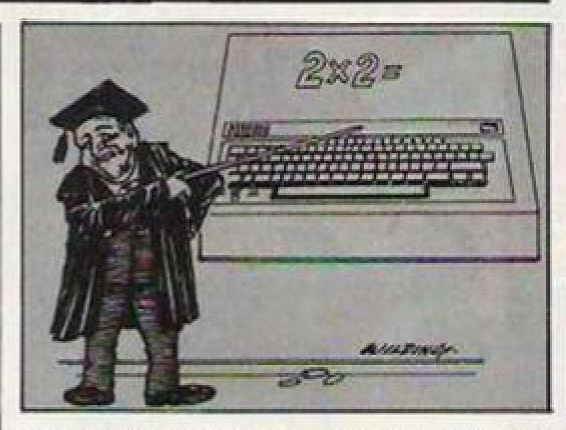
.9 i.e. reduce them by 10 percent. Now enter F1 for formula again and enter K2. This will do nothing to the values already in column 2 but it does remove the previous formula from the column. This is only necessary when you use a formula to act on values in its own column, otherwise each time F3 recalculate is used the values in column 2 would be reduced by a further 10 percent.

The previous example showed how the formula command can be used to carry out arithmetical calculations on columns e.g. K2 × K3. You can also use it for calculations of the type (28 × 10? + 5 or π × 17/4. In fact any of the computers own functions can be used e.g. INT (π*30) is quite valid.

However, this sort of formula will produce the same answer in each row of a column so its use is limited. An interesting variation is achieved however if the letter R is used in a formula. Now R is the variable used in the program to denote the row number so if R is used on its own it will result in the row number being printed in each operative row in a column.

If it is used in combination with some other function or number it can be used to increment. e.g. 10 + (R*.1) will progressively increase the value of 10 by 10 percent. The reverse of this formula will of course decriment the value. R is therefore a powerful tool for loading and manipulating data in the worksheet.

I have used the term operative rows a couple of times within the text and I feel now that I should explain it. When you first enter the sheet it has in fact no size at all, it does however grow as you enter values so that its maximum depth of anytime is only as deep as the last value entered down a column, this is also true for the length of the sheet. The reason for this is to ensure that the calculating functions are not operating needlessly on empty cells.



It also ensures that only the necessary cells are stored when the Save F9 is used. The self expansion of the sheet therefore saves considerable computer time, so it is unwise to use more of the sheet than is necessary as it will only cause delays in the calculations.

If the Escape key is pressed at any time you will be taken to the initial menu.

If a formula is entered incorrectly this will generate an error and again send you to the initial menu.

If the return key is pressed on its own the value above the cursor will be deleted.

If you have difficulty in getting the program to work or simply can't stand the thought of typing in the whole listing, I can supply the program on cassette for £4 if you write to me at 11 Meadhurst Road, Leicester.

Function keys.

F0 — ←+→ This key is used to change the pointer in the top Left hand corner. The direction in which the arrow points is the direction in which the cursor will move after an entry has been made. A plus sign "+" means the cursor will remain stationary.

F1 — Formula This key is used to enter a formula into a column. Before using ensure that the cursor is somewhere within the column that the formula is required in.

F2 — Sum This key is used to sum all the values in a column that the cursor resides in.

F3 — Re-calculate This key is used to re-calculate the whole sheet after a change has been made.

F4 — Sort This key will sort a column in which the cursor resides into ascending order and move all the other columns with it.

F5 — Over Print This key offers the option of over printing either Titles or Labels or both when the screen is showing any position on the sheet.

F6 — Jump This key allows you to move rapidly to any position on the sheet by entering the column and row location.

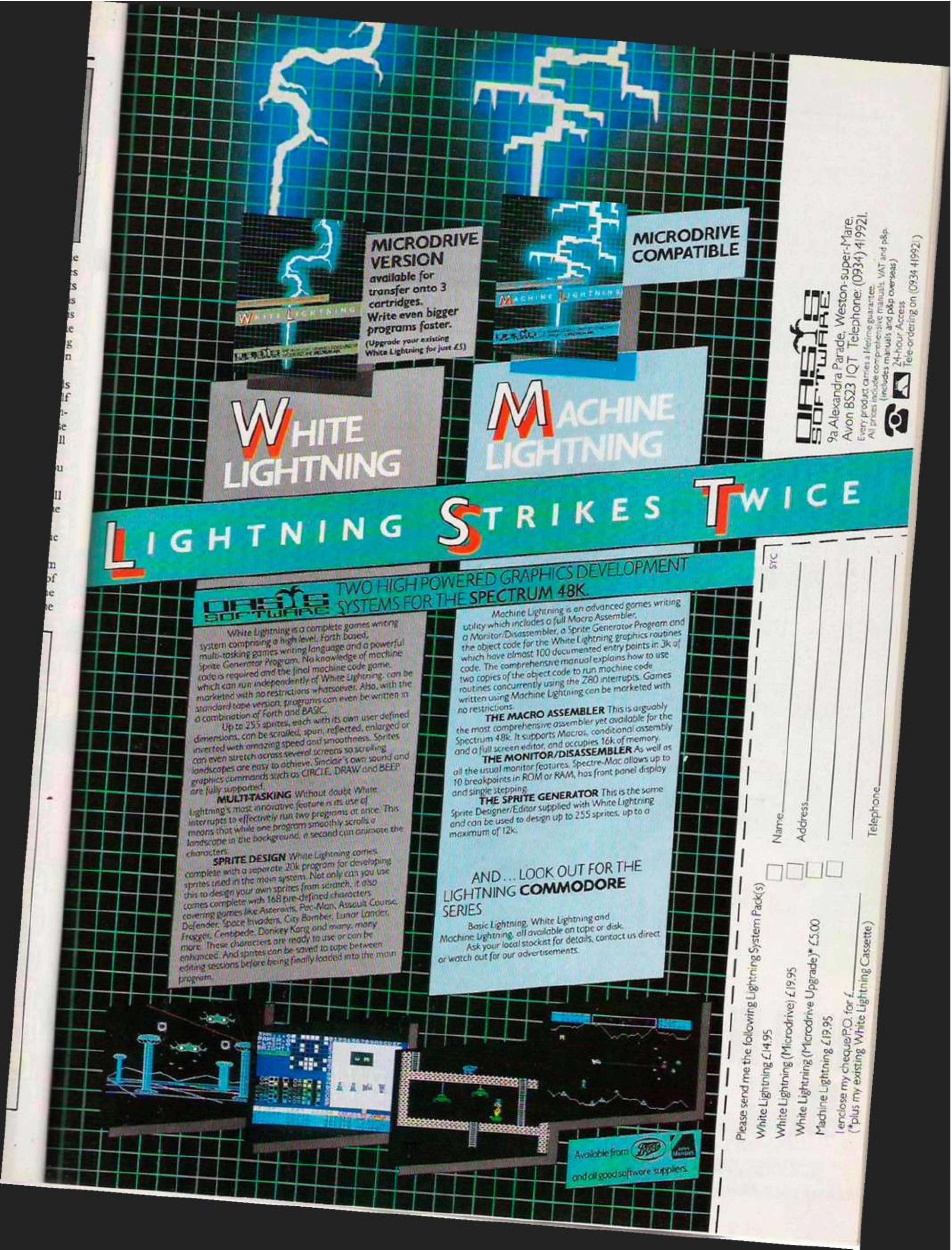
F7 — Decimal Places This key changes the number of decimal places in use between 0 and 3. The number of places in use is displayed at the top Right hand corner.

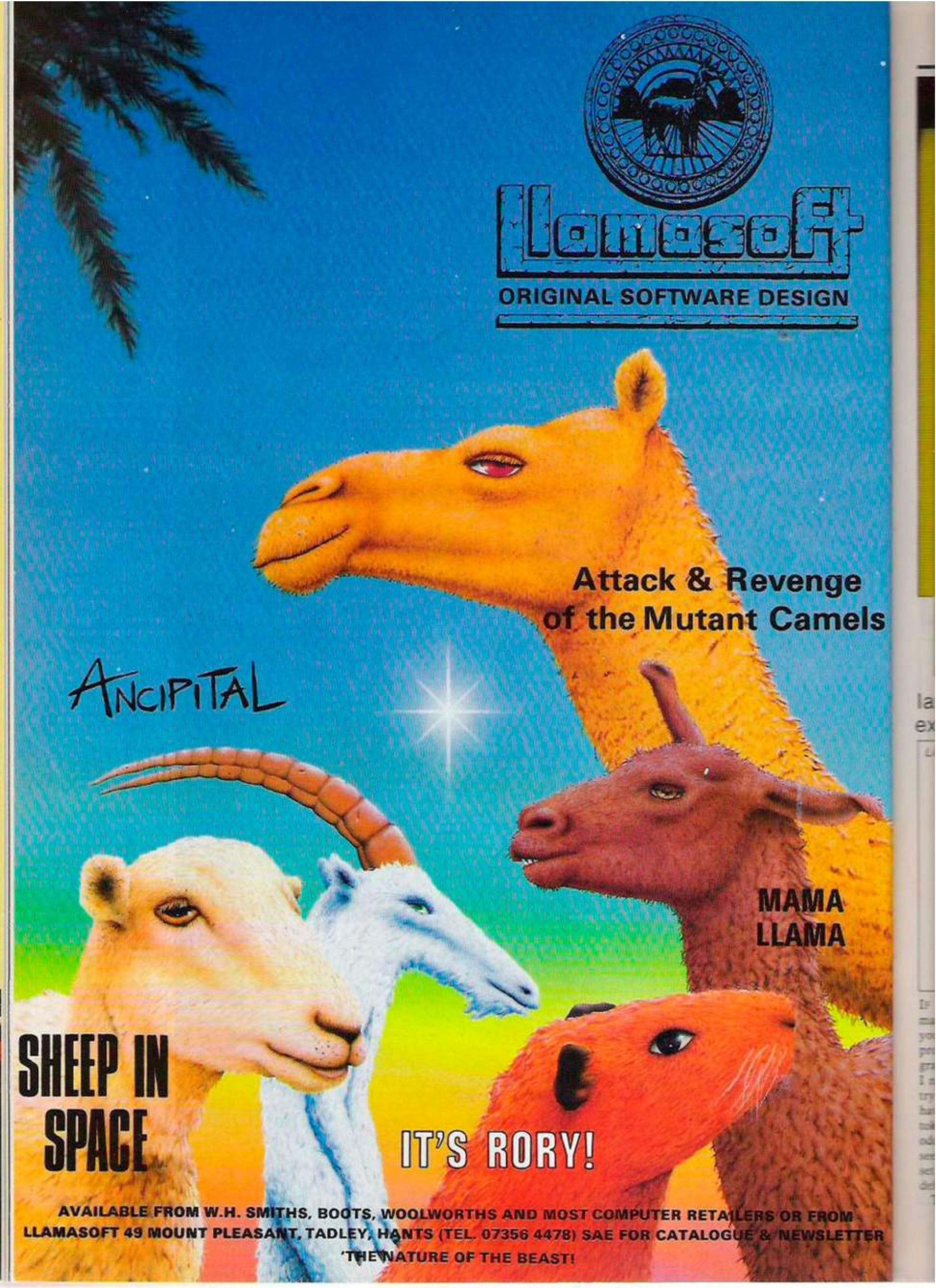
F8 — Printer This key brings a printer into operation, you need to say how many columns you can fit onto a sheet. Eight columns will normally fit onto A4 size paper.

F9 — Save This key allows the data on the sheet to be saved.

(continued from previous page)

```
2055NEXT
2060X$=STR$(SX/10^DP):X$=LEFT$(X$,8):X$=STRING$(8-LEN
X$," ")+X$
2070F$(N)=LEFT$(F$(N),FP)+X$+RIGHT$(F$(N),LEN F$(N)-(
FP+8))
2075IF KP=36 THEN ENDPROC
2085PROCPRINT_SHEET
2090ENDPROC
2490
2499
2500REM:::::::::::CALCULATE WHOLE SHEET::::::::::
2502PRINTTAB(0,0)CHR$130;CHR$136;"RE-CALCULATING"
2505R3=R
2507CL=1
2510FOR CN=CL TO CN2
2520FP=CN*9-6:IF LEN A$(CN)=0 THEN GOTO2600
2530N4=1
2540FOR R=N4 TO N2
2550IF ASC MID$(F$(R),FP+8,1)>57 OR ASC MID$(F$(R),FP
+8,1)<46 AND ASCMID$(F$(R),FP+8,1)>32 THEN GOTO 2590
2560ON ERROR GOTO 9100
2570SX=EVAL A$(CN)*10^DP+.5:X$=STR$(SX/10^DP):X$=LEFT
$(X$,8):X$=STRING$(8-LENX$," ")+X$
2585F$(R)=LEFT$(F$(R),FP)+X$+RIGHT$(F$(R),LEN F$(R)-(
FP+8))
2590NEXT R
2595IF MID$(F$(N),FP+1,8)<>"        " THEN PROCSUM_A_
COLUMN
2600NEXT
2605R=R3
2610PROCPRINT_SHEET
2620RETURN
2990
2999
3000DEF PROCSORT
3005PRINTTAB(0,0)CHR$130;CHR$136;"SORTING"
3010PROCFIND_CELL_IN_STRING
3020LOCAL R
3025R=1
3030IF 2^R>N2 THEN GOTO 3040 ELSE R=R+1:GOTO3030
3040F1=2^R-1
3050F1=INT(F1/2)
3060IF F1=0 THEN ENDPROC ELSE D=N2-F1:B=1
3080R=B
3090E=R+F1
3100IF ASC MID$(F$(R),FP+8,1)>57 OR ASC MID$(F$(R),FP
+8,1)<46 ORASC MID$(F$(E),FP+8,1)>57 OR ASC MID$(F$(E)
,FP+8,1)<46 THEN GOTO3120
3110IF EVAL MID$(F$(R),FP+1,8)>EVAL MID$(F$(E),FP+1,8
) THEN GOTO 3140
3120B=B+1
3130IF B>D THEN GOTO 3050 ELSE GOTO 3080
3140M$=RIGHT$(F$(R),LEN F$(R)-3):N$=RIGHT$(F$(E),LEN
F$(E)-3)
3150X$=M$:M$=N$:N$=X$
3160F$(R)=LEFT$(F$(R),3)+M$:F$(E)=LEFT$(F$(E),3)+N$
3170R=R-F1:IF R<1 THEN GOTO 3120 ELSE GOTO3090
3190
3199
3200DEF PROCOVER_PRINT_LABELS
3205IF OP<>0 AND KP<>38 THEN GOTO3235
3220PRINTTAB(0,0);CHR$134;">";"HEADINGS/TITLES/BOTH/C
ANCEL ";
3230INPUT""X$
3235PROCFIND_CELL_IN_STRING
3240IF X$="B" OR OP=1 THEN PROCOVER_PRINT_HEADINGS_AN
D_TITLES
3250IF X$="T" OR OP=2 THEN PROCOVER_PRINT_TITLES
3255PRINTTAB(0,0);">";SPC(20)
3260IF X$="H" OR OP=3 THEN PROCOVER_PRINT_HEADINGS
3270IF X$="C" THEN OP=0:PROCPRINT_SHEET
3290ENDPROC
3290
3299
3300DEF PROCOVER_PRINT_HEADINGS_AND_TITLES
3305LOCAL R
3310X=2:FOR R=M TO M+8:X=X+2:PRINTTAB(3,X);MID$(F$(R)
,4,8):NEXT:PRINTTAB(3,4);MID$(F$(1),K*9-5,35)
3320OP=1
3330ENDPROC
3390
3399
3400DEF PROCOVER_PRINT_TITLES
3405LOCAL R
3410X=2:FOR R=M TO M+8:X=X+2:PRINTTAB(3,X);MID$(F$(R)
,4,8):NEXT
3420OP=2
3430ENDPROC
3490
3499
3500DEF PROCOVER_PRINT_HEADINGS
3510PRINTTAB(3,4);MID$(F$(1),K*9-5,35)
3520OP=3
3530ENDPROC
3690
3699
3700DEF PROCJUMP
3710PRINTTAB(0,0)+CHR$132;"ENTER COLUMN THEN ROW > ";
3720INPUT""X
3722PRINTTAB(29,0);
3725INPUT""Y
3727IF X=0 THEN X=1:IF Y=0 THEN Y=1
3730M=Y:IF M>N1-L+1 THEN M=N1-L+1
3740K=X:IF K>=C1-3 THEN K=C1-3
3760ENDPROC
3990
3999
4000DEF PROCDIRECTION_OF_CURSOR_AFTER_ENTRY
4010PD=PD+1:IF PD>5 THEN PD=1
4020PRINTTAB(0,3);CHR$11;CHR$130;MID$(P$,PD,1);CHR$13
5
4030ENDPROC
4190
4199
4200DEF PROCFIND_CELL_IN_STRING
4210Fn=(R-3)/2+M-1:FP=C+(K*9)-9:CN=(C-3)/9+K
4220IF ASC MID$(F$(Fn),FP+1,8)=32 AND Fn>N2 AND LAST
=1 THEN N2=Fn
4230IF ASC MID$(F$(Fn),FP+1,8)=32 AND CN>CN2 THEN CN
2=CN
4240LAST=0
4250ENDPROC
4600DEF PROCDECIMAL_PLACE_CHANGE
4610DP=DP+1:IF DP>3 THEN DP=0
4615@%=&10
4620PRINTTAB(38,3);CHR$11;CHR$130;DP;CHR$135
4630IF DP=0 THEN @%=&0100000A
4640IF DP=1 THEN @%=&0102010A
4650IF DP=2 THEN @%=&0102020A
4660IF DP=3 THEN @%=&0102030A
4670ENDPROC
4800DEF PROCPRINTER
4802PRINTTAB(0,0);CHR$129;"IS PRINTER CONNECTED ? ";
4004INPUT""X$:IF X$="N" OR X$="NO" THEN ENDPROC
4005PRINTTAB(0,0);CHR$129;"NUMBER OF COLUMNS PER PAGE
?";
4006INPUT""X$
4010W=EVAL X$*9:WIDTH W=3:VDU2:W2=-(W-4):*FX3,10
4015REPEAT
4017W2=W2+W:IFW2+W>237 THEN W2=237-W
4020LOCAL R
4030FOR R=1 TO N2
4040PRINT MID$(F$(R),W2,W):NEXT
4045PRINT;STRING$(W-3,"_")
4050PRINT MID$(F$(N),WC,W)
4057PRINT ""
4060UNTIL (W2-3)/9 =CN2-(W/9)
4070VDU3:*FX3,0
4075VDU3
4080ENDPROC
5000DEF PROCSAVE
5002*OPT1,1
5005PRINTTAB(0,0);CHR$130;
5010X=OPENOUT("CALCDATA")
5012PRINT#X,CC,PD,C,K,HL,M,KP,P$,R
5015PRINT#X,K$,N1,N,L,J,N2,C1,LAST,CN2,OP,DP,F$(N)
5020FOR Y=1 TO N2
5030PRINT#X,F$(Y)
5040NEXT Y
5050 FORY=1 TO CN2
5060PRINT#X,A$(Y)
5070NEXT Y
5080CLOSE#X
5087PRINTTAB(0,1)SPC 37
5090ENDPROC
5200REM:::::::LOAD DATA FROM TAPE:::::
5201*OPT1,1
5202CLS:PRINTTAB(1,5);CHR$129;"LOAD DATA TAPE AND PRE
SS RETURN":KP=GET:PRINTTAB(0,10);CHR$130;"O/K   ";
5205CLEAR
5210DIMF$(51):DIMA$(26)
5230X=OPENIN("CALCDATA")
5232INPUT#X,CC,PD,C,K,HL,M,KP,P$,R
5235INPUT#X,K$,N1,N,L,J,N2,C1,LAST,CN2,OP,DP,F$(N)
5240FOR Y=1 TO N2
5250INPUT#X,F$(Y)
5260NEXTY
5272FOR Z=1 TO CN2
5273INPUT#X,A$(Z)
5274NEXTZ
5290CLOSE#X
5295*OPT1,0
5300FOR X=N2+1 TO N1
5310X$=STR$ EVAL "X"
5320F$(X)=X$+STRING$(3-LEN X$," ")+STRING$(C1,"
 ");
5330NEXT
5340CLS:PROCPRINT SHEET:SOUND1,-5,75,3:SOUND1,-7,65,5
:PD=PD-1:DP=1:GOTO500
9000REM:::::::ERROR TRAPPING:FORMULA::::::::::
9010ON ERROR OFF:HL=R+1
9020IF HL<>N2 THEN GOSUB1650 ELSE PROCPRINT SHEET
9040HL=1:R=N2:PRINTTAB(0,0);">";SPC(30-LEN X$):SOUND1,
-5,150,2:GOTO 535
9100REM:::::::ERROR TRAPPING:CALCULATE SHEET:::::::
9110ON ERROR OFF:HL=R+1
9120IF HL<>N2 AND CN<>CN2 THEN GOSUB2540
9140[illegible]
9170[illegible]
9180[illegible]
[illegible]
```


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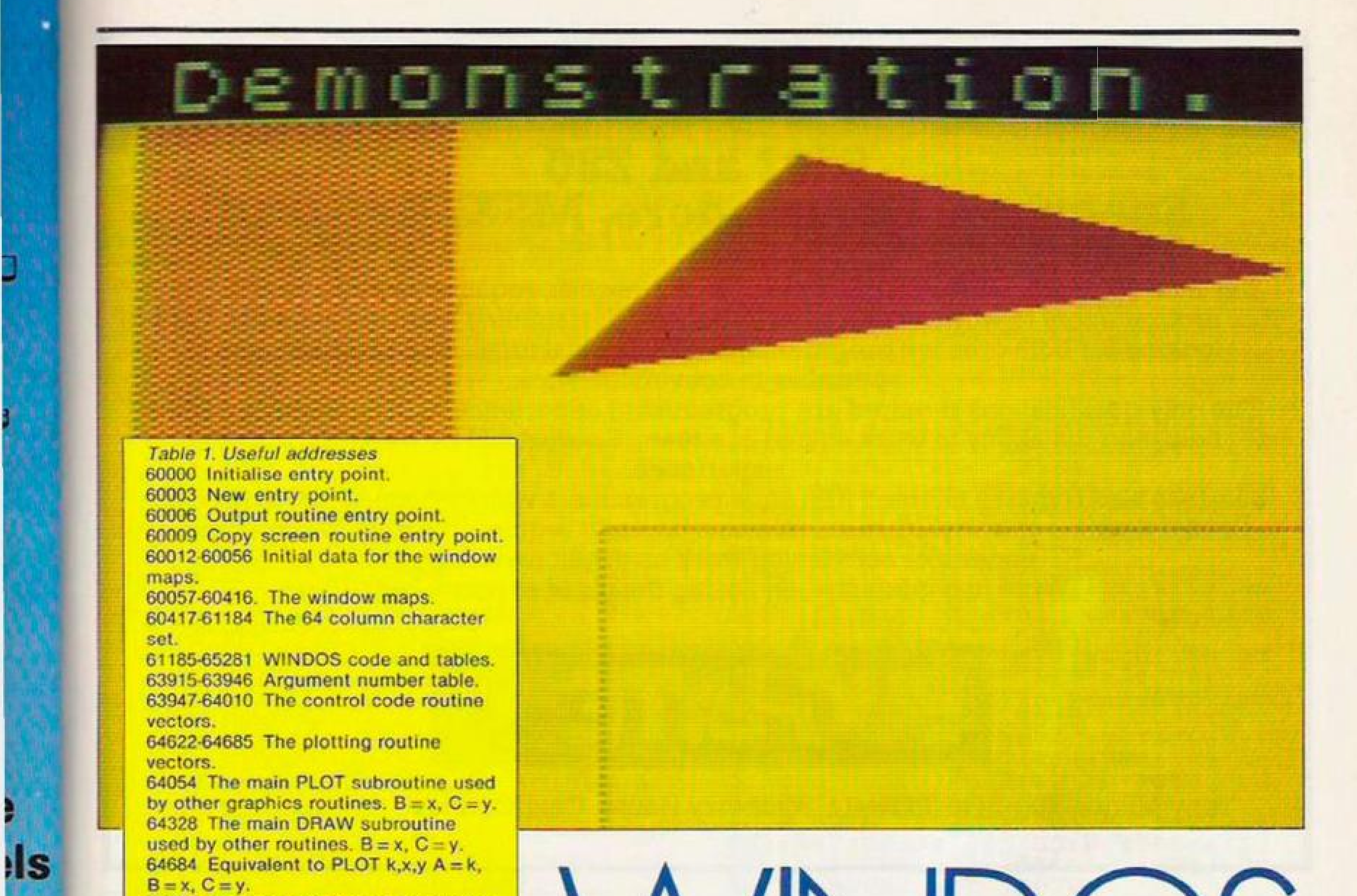


Table 1. Useful addresses

60000 Initialise entry point.
60003 New entry point.
60006 Output routine entry point.
60009 Copy screen routine entry point.
60012-60056 Initial data for the window maps.
60057-60416. The window maps.
60417-61184 The 64 column character set.
61185-65281 WINDOS code and tables.
63915-63946 Argument number table.
63947-64010 The control code routine vectors.
64622-64685 The plotting routine vectors.
64054 The main PLOT subroutine used by other graphics routines. B = x, C = y.
64328 The main DRAW subroutine used by other routines. B = x, C = y.
64684 Equivalent to PLOT k,x,y A = k, B = x, C = y.
23728 The base address of the current window map.

WINDOS

Ian Briscoe continues his explanation of Windos.

Listing 1.

```
10 REM
20 REM New CHR$ 29
30 REM Written by Ian Briscoe
40 REM August 1984.
50 REM
60
70 PRINT "Make sure that WINDOS
    is in memory.If not BREAK
    and LOAD"
80 PAUSE 0
90 FOR a=65300 TO 65318
100 READ data
110 PRINT a;TAB 16;data
120 POKE a,data
130 NEXT a
140
150 REM Now change the vector
160 REM Low byte first
170 POKE 64005,20
180 REM High byte next
190 POKE 64006,255
200
210 PRINT "Finished."
220 STOP
230
1000 REM
1010 REM Data for code.
1020 REM
1030
1040 DATA 221,102,44,221
1050 DATA 110,43,1,0
1060 DATA 24,126,47,119
1070 DATA 35,11,120,177
1080 DATA 32,247,201
```

If you typed in last month's listings, and managed to get them to work perfectly, then you should by now have realised that used properly, Windos is a pretty powerful aid to graphics creation. There are a few quirks that I neglected to point out last month — if you try to List with the new routines, you will not have a chance to stop the listing, and also no tokens will be printed as tokens, but instead as odd characters. This is not as hopeless as it seems, because you can now set up a character set in Ram, and use codes 128-255 as the user-definable characters.

The normal system variable CharS is the system's character set pointer, except in 64 column mode, as this has its own font near the start of Windos. In addition, you may have discovered that the Plot command works on a full 256 by 192 grid.

Now to the main business. This article is aimed primarily at hackers — ie. fanatical machine-code buffs who delight in nosing their way through other people's programs and systems, and altering them to their own tastes — and ordinary machine-code addicts. You will see in table 1 that there are a few vector tables, which hold addresses of plotting routines, control codes etc. To start with, we'll look at the control code vectors. Remember the window map and the parameter queue?

Well, this is where they comes in. Throughout the following, the byte numbers refer to bytes in the window map, numbered 0-44. When a character gets sent to be printed, it first goes into the A register, then through the current channel until it reaches the output routine.

When it reaches the one in Windos, one of two things can happen. If A is 32 or above, then an ASCII character is output. However,

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if A is 31 or below, a fair amount of work gets done before anything happens. First the number of parameters it has are checked, by referring to the 32 byte argument table, one byte for each control code.

If this is zero, then the execution address is found by doubling A, adding this to the base address of the control code table, then, in effect, an indirect Call to the appropriate routine occurs. However, if the number of parameters is more than 0, then first the queue is initialised. This is where all the parameters are going to be stored before execution.

Byte 30 becomes A, and byte 33 becomes the number of parameters left to arrive before execution of the control code. Then, on subsequent outputs, the parameters are queued, from byte 15 onwards and byte 33 decremented by 1. When this reaches 0, then the code is executed. The code routine uses (IX+15) etc to fetch the parameters since IX holds the base address of the current window map. Then the whole show starts again when the next character comes through. Confused?

An example of how to alter one of these codes will show the potential of altering these tables. The control code to be changed is CHR$ 29. Normally, this transfers the screen memory to the display memory, but usually these are one and the same. So, to change it to a code which inverts the whole screen, we first need a screen invert routine. See listing 1.

Now we need to change the appropriate vector in the control code vector table. Its address is Base Address, which is 63947, plus two times the code number, so in this case this is 63947 + (2*29) = 64005.

Now using the normal Intel format, 64005 becomes the low byte and 64006 the high byte

(continued on page 135)

Listing 2.

```
  10 REM
  20 REM Loader for EXTBASIC.
  30 REM Written by Ian Briscoe.
  40 REM August 1984.
  50 REM
  60:
  65 CLEAR 58999
  70 LET line=1000
  80 RESTORE 1000
  90 LET address=59000
 120 FOR a=1 TO 18
 130    GO SUB 500
 135    PRINT line;" OK."
 140    LET line=line+10
 150 NEXT a
 152 CLS
 155 PRINT "Code in memory."
 157 PRINT "Insert cartridge & p
ress a key."
 160 PAUSE 0
 165:
 170 PRINT "Saving ""LOADER"""
 180 SAVE *"m";1;"LOADER"
 190 PRINT "Verifying...";
 200 VERIFY *"m";1;"LOADER": PRI
NT " OK."
 230 PRINT "Saving ""BASIC"""
 240 SAVE *"m";1;"BASIC"CODE 590
00,901
 250 PRINT "Verifying...";
 260 VERIFY *"m";1;"BASIC"CODE 5
9000: PRINT " OK."
 270 PRINT "Finished saving."
 280 STOP
 500 REM
 510 REM Reader and poker.
 520 REM
 530 READ a$: READ checksum
 535 LET total=0
 540 FOR i=1 TO LEN a$ STEP 2
 550    LET high=CODE a$(i)-48
 560    LET low=CODE a$(i+1)-48
 570    LET high=high-39*(high>9)
 580    LET low=low-39*(low>9)
 590    LET byte=(16*high)+low
 600    LET total=total+byte
 610    POKE address,byte
 620    LET address=address+1
 630 NEXT i
 640 IF total<>checksum THEN PRI
NT "Error in line ";line;"."'"Ch
eck and re-run.": STOP
 650 RETURN
 660:
1000 DATA "cf312183e622b75cc9000
02a5d5c2281e6dd213be92a81e6225d5
cdd4600dd23d71800f620ddbe00280f0
404dd2310fcafdd",5404
1010 DATA "be0020dfc3f001d72000d
d2310e0dd6e00dd6601e90000d77a1cc
db705d7d52ddaf00132c0e6d7d52ddaf
00132bfe616005f",6194
1020 DATA "2a535c18107223733ac0e
6471310fd234e234609233a4b5cbd20e
a3a4c5cbc20e4c3c105cdb7053e1fd76
6eac3c105d77a1c",5164
1030 DATA "cdb705d7d52ddaf001f5d
7d52ddaf001f53e07d766eaf1d766eaf
1d766eac3c105d77a1cd71800fe2cc2f
001d72000d77a1c",7293
1040 DATA "cdb7050604c5d7d52ddaf
001c1f510f53e01d766ea0604f1c5d76
6eac110f8c3c105d7821ccdb705d7d52
ddaf001f53e00d7",6914
1050 DATA "66eaf1d766eac3c105003
e01327be7d7821cd71800fe2c200cd72
0003a7be73c327be718eafe0d2807fe3
a2803c3f001cdb7",5816
1060 DATA "053a7be747c5d7d52ddaf
001c1f510f53a7be747f1d766ea10fac
3c105d77a1cd71800fe2cc2f001d7200
0d7821ccdb705d7",6815
1070 DATA "d52ddaf001f5d7d52ddaf
001f5d7d52ddaf001f53e0ed766eaf1d
766eaf1d766eaf1d766eac3c105cdb70
5dd2ab05cddcb0c",8072
1080 DATA "b6c3c105cdb705dd2ab05
cddcb0cf6c3c105cdb705d760eac3c10
5cdb705d763eac3c105d7821ccdb705d
7a22ddaf001ed43",7190
1090 DATA "3de8d70000c3c105d77a1
ccdb705d7a22ddaf001c5d7a22ddaf00
1c5e1d1732372c3c105cdb705dd2ab05
cddcb0ceec3c105",6897
1100 DATA "cdb705dd2ab05cddcb0ca
ec3c105d77a1ccdb705d7d52ddaf001f
5d7d52ddaf001f53e1cd766eaf1d766e
af1d766eac3c105",7657
1110 DATA "cdb705dd2ab05cddcb0dd
eddcb0d96c3c105cdb705dd2ab05cddc
b0dd6ddcb0ddec3c105cdb705dd2ab05
cddcb0d9eddcb0d",7146
1120 DATA "d6c3c105cdb705dd2ab05
cddcb0d9eddcb0d96c3c105d7821ccdb
705d7d52ddaf001f5dd2ab05cdd7705c
3c105d7821cfe2c",6989
1130 DATA "c2f001d72000d7821cfe2
cc2f001d72000d7821ccdb705d7d52df
5d7d52df5d7d52ddd2ab05cdd7729f1d
d772a3e02d766ea",6860
1140 DATA "f1d766eac3c105042a707
5747ce7042a7664757ce7052a706c6f7
4c1e7072a7363726565 6e62e7062a777
06f6b650be7072a",5492
1150 DATA "7363726f6c6cfde8062a6
373697a657ae8032a75709ee8052a646
f776eb0e8052a6c656674c2e8062a726
9676874d4e8062a",5625
1160 DATA "6c617267655ee8072a6e6
f726d616c6ce8062a3332636f6cfee70
62a3634636f6c0ce8052a696e69741ae
8042a6e657723e8",4939
1170 DATA "052a646f6b6542e8052a6
3616c6c2ce8062a72656e756dc1e6072
a77696e646f772fe7042a636c7300e70
52a67636f6ce6e800",5041
```



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Listing 3.

```
5000 REM
5002 REM Extended Basic demo.
5004 REM MERGE with the main
5006 REM WINDOS demo.
5007 REM The main demo must be
     in memory before this one.
5008 REM.
5010 REM Picture 2.
5020 REM
5030
5040 PAUSE 0
5042 LOAD *"m";1;"BASIC"CODE
5044 RANDOMIZE USR 59000
5050 *SCREEN 3
5052 *WPOKE 4,86
5054 *WINDOW 0,2,31,23
5056 *GCOL 86
5058 *WPOKE 40,248
5060 *PLOT 3,10,17
5062 *WPOKE 38,BIN 11001100
5064 *PLOT 20,79,100
5066 *VDU 7,38,255
5068 *PLOT 3,150,25
5070 *PLOT 3,250,50
5072 *PLOT 16,100,75
5074 *PLOT 8,200,50
5076 *PLOT 3,110,110
5078 *PUT 7,38,BIN 10101010
5080 *PLOT 12,255,180
5082 *PLOT 3,1,16
5084 *WPOKE 38,BIN 11110000
5086 *PLOT 21,255,191
5088 *WPOKE 38,15
5090 *PLOT 3,1,16
5092 *PLOT 21,255,191
5094 *WPOKE 38,255
5096 *PLOT 3,0,16
5098 *PLOT 22,255,191
5100 *LARGE:*CSIZE 2,10:*RIGHT
5102 *PLOT 24,0,48
```

(continued from page 133)

of the routine address, in this case 65300. The listing shows how its all done. If we wanted to add a routine which needed parameters then we would have had to have changed the appropriate byte in the argument number table.

Providing you know Z-80 assembly language, altering Windos is not at all difficult. At the start of Windos there are four JP addresses. The first two you know, at 6000 and 60003, but 60006 is the entry point to Windos' output routine. Just LD A,n and Call 60006 within your routines. Every single register is saved, except the I and R registers. Obviously, this slows things down a bit, but the peace of mind of knowing that no registers will be corrupted is worth it.

This vector can be altered so that before outputting a character, something else can be done, like a beep, before jumping back to the output routine. This might be useful to someone. The fourth jump is to the copy screen routine. This normally points to a Copy routine for the ZX Printer, which incidentally copies all 192 pixel lines.

However, this can be altered so that it jumps to a full-size printer copy outline instead, and this will be useful to those fortunate enough to have real printers. CHR$ 15 uses this, so any change to this would affect CHR$ 15.

Determined hackers may like to look around the graphics area of Windos. All the relevant addresses are to be found in table 1.

Hopefully, after reading this you will understand and appreciate more fully the thinking behind Windos. I have tried to make it as expandable as possible while still leaving plenty of memory to work with.

You may be cursing the inadequacies of Sinclair Basic which make many programs using Windos fairly bulky or tedious to write. Here is a partial solution which will help Interface 1 owners no end. In a mere 901 bytes I have added 23 commands to the Spectrum's vocabulary using the very well documented method of extending the Basic, which will not be described here.

To keep the size of the Basic down, I used a list to hold the addresses, the command name itself and the length of the name, and I will show you how to add to this list at the end of this article. This method makes adding commands easy.

First of all, to get the Basic going type in and save the loader program. Then Run it. If there are no errors, Saving will begin automatically on Microdrive cartridge. Then, to initialise the Basic, type

RANDOMIZE USR 59000

This must be typed every time you load in the Basic, or want to re-initialise, possibly after a New. Now, making sure Windos is in memory, type the following command line:

*NEW:*INIT:OPEN # 2, "p"

Windos has just been initialised. If the system crashes, check your listing for errors that the checksuims were not able to detect. The full list of commands is as follows:

*PUT n,n,n . . . or *VDU n,n,n . . . n

These are exactly the same and simply output the character codes n directly through the Windos output routine — this is necessary because of the weird things that happen if you don't! — Careful of too many parameters, since the machine stack is used to hold them.

*PLOT mode + routine,x,y: This is exactly the same as CHR$ 14, except it looks much better!

*WPOKE byte, value: This is the window poke. Beware of byte numbers over 44 — you will be poking another window map.

*CSIZE width, height: The same as the QL command, and the same as CHR$ 28.

*UP, *DOWN, *LEFT, *RIGHT: These four commands set the direction of the large printing. Careful use can lead to some very professional effects.

*LARGE: Sets large characters mode.

*NORMAL: Resets to either 32 or 64 column mode, depending on what bit 6 of byte 12 is.

*32COL: Sets the 32 column mode.

*64COL: Sets the 64 column mode.

*INIT: Initialises Windos, and interfaces it to the standard Spectrum system. Equivalent to RANDOMIZE USR 60000.

*NEW: Resets all eight window maps. Equivalent to RANDOMIZE USR 60003.

*DOKE address, contents: This is a two byte Poke, nothing to do with Windos.

*CALL address: Calls the machine-code routine at the specified address.

*RENUM start, increment: At last, a renumber command. No Gotos or Gosubs done, and the parameters are 8 bit not 16. *RENUM 10,10 is valid, but *RENUM 1000,300 is not.

*SCROLL byte 41, byte 42, repeat no: This is a very useful command for setting up first the pixel scroll register and then the attribute register. Then the actual scrolling takes place. The registers remain altered after this command so *VDU 2, number would result in the same scroll taking place.

*WINDOW tlx,tly,brx,bry: This is the same as CHR$ 1, ie. it defines the window size.

*CLS: This is obvious!

GCOL: This sets the graphics attribute. Note: All of the commands must be preceded by a '' but thereafter, Upper or lower case may be used in any order, eg. *Large is valid. Also because of the Rom routine NXTCHR, a command spaced out eg.

*Normal would be accepted. The demonstration is a copy of the subroutine 'picture 2' in the main demo of Windos, and shows how concise programming may be achieved. Obviously, the *Plot, *VDU, *Put and *WPoke commands will be used most often and these will cut the size of your programs down a great deal.

There now follows an explanation of the method used to enable lots of commands to be added in a relatively small amount of memory. There is a list at the end of the Basic starting at 59707 and finishing at 59900 and it takes the form:-

```
LIST DEFB length of following string
     DEFM "*command"
     DEFW address of syntax and runtime
     routine

     DEFB 0 terminates the list
```

Now, the final 0 which terminates the list is at address 59900. There are 99 bytes spare between here and the start of Windos, plenty of room in which to place (a) new command description(s), but make sure that the DEFB always contains the full length of the string following, and that the list is terminated by a 0. To get the base address of the current window map into IX just use in assembly language,

LD IX,(23728)

Of course, you need a lot of information and a good assembler before you can start creating the Basic of your dreams. I would suggest that, money permitting, Hisoft's Devpac and Dr Ian Logan's books, *Spectrum Microdrive Book* and *The Complete Spectrum Rom Disassembly* are absolute essentials, not forgetting the trusty old Spectrum Manual.

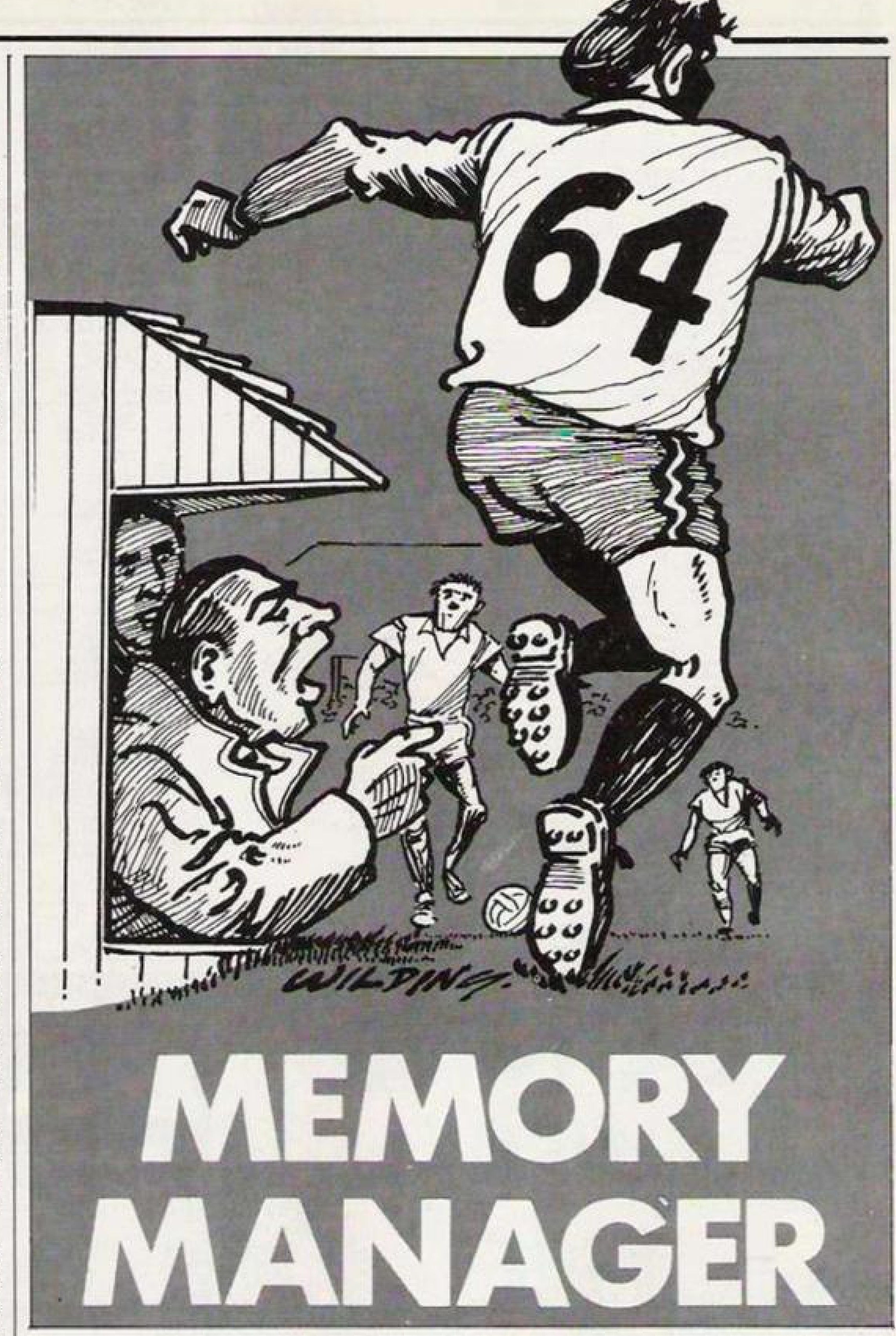
If you run out of list space, the address which holds the list pointer is 59019, but take care when changing this, and transferring the old list to its new location, unless of course you don't need the commands for Windos, or Windos, in which case you have 5K of list space available.

I hope that you will find a use for Windos and the extended Basic, but to give you some ideas, why not write a 64 column word processor, or spreadsheet, or try your hand at a text and graphics adventure, using the various graphics routines, and remember that the Sinclair graphics routines still work.

Other ideas are a drawing program making use of the alternative screen facility, or for the very ambitious, a multi-tasking language in machine code making use of the windows, which have completely separate identities.

Once again, if you haven't the time or the energy to type in the listings or you have lost the relevant issues, a tape is available for £3.50 from Ian Briscoe, 32 York Road, Maidstone, Kent, ME15 7QY, which has all the programs and a few extra character sets thrown in. ■

MEMORY MANAGER



D M Brown with an aid to saving memory on the CBM-64.

MEMORY MANAGER provides a number of extra facilities for saving blocks of memory for both machine code and basic manipulation.

To understand how it works we must first have a look at the way information is stored on tape. Figure 1 shows this in diagramatic form. The program or data file has at the start a "header". This tells the computer what type of information follows, where it should be located in memory as it is loaded, and what name it has, if any. The possible identities (ID) are as follows:-

1. Program header.
2. Data set.
3. Binary data.
4. Data header.
5. End of tape marker.

The ID is the first byte in the header. Then there are two numbers — four bytes — defining the memory locations to be used. Remember, the numbers are nearly always stored with the low byte first followed by the high byte. The first number is the starting address, the second is the finish or end address and the data following the header will normally be sent to successive locations from the start address to the end address.

Occasionally it may be required to load the data into an area of memory different from that specified by the header. In this case the destination is defined immediately following the header.

Data can be put on tape by the Save or Print# commands in Basic or by transferring information using machine code. Both the Print and machine code methods are available in this program. In general Method 1 is used to define a Basic language process and Method 2 a machine language version.

In general, the Basic version is protected by various automatic checks in the operating system while the machine code version is not. The machine code version takes typically one third of the time to execute.

So how do we use the program? Figure 2 shows the available menu. Decide on the area of memory you wish to save. All addresses are decimal. A hex to decimal or decimal to hex conversion can be done using options 3 and 4 from the menu respectively. When you enter "1" from the menu indicating "Save" you will then be asked to choose Method 1 or Method 2 for a Basic save or a machine code save.

With either method you will need to enter the start address and the finish address of the section of memory you wish to save plus the name you wish to allocate to the file. Do not be surprised if having decided on a Method 1 save the tape keeps stopping and starting. This happens every time the tape buffer is transferred to the tape and has to be refreshed. When the tape stops the screen also flashes to the normal display. At the end of the save the program returns to the menu.

To get the file from tape back into memory enter 2 from the menu. Again you have to say whether you wish to use Method 1 or Method 2. You must use a Method 1 load for a program saved by Method 1 and a Method 2 load for one saved by Method 2. What happens if you forget what you used? This is where the header routines, called from number 5 on the menu, are useful.

Figure 2: Available menu.

Menu	
1. Save	4. Dec to hex
2. Load	5. Header
3. Hex to dec	6. Free bytes
	7. Exit

Figure 1: Format of a header.

Start of header

ID	START ADDRESS	END ADDRESS	N	A	M	E	32	32
1st Byte	← 4 Bytes →		File name up to 16 characters. Names less than 16 characters in length are extended by spaces.					

The clue is the ID. Look at the header using Method 1 or Method 2. At this stage beware, a header Method 1 used for a program saved by Method 2 will give a "string too long" error. This is not too bad as you will immediately use Method 2 header to get the necessary information. More misleading is the problem of using the Method 2 header routine with a tape saved by a Method 1 save. In this instance you appear to have the correct information.

As far as the header is concerned this is true, but the addresses are not the addresses where the data will be sent, rather they are the addresses where the Basic program resides. The memory addresses you need actually follow the header and you must use a Method 1 header routine to display them. How do you know then what to use? Look at the ID. A

(continued on next page)

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header showing an ID of 1 is a program header so a Method 2 header and load routine should be used.

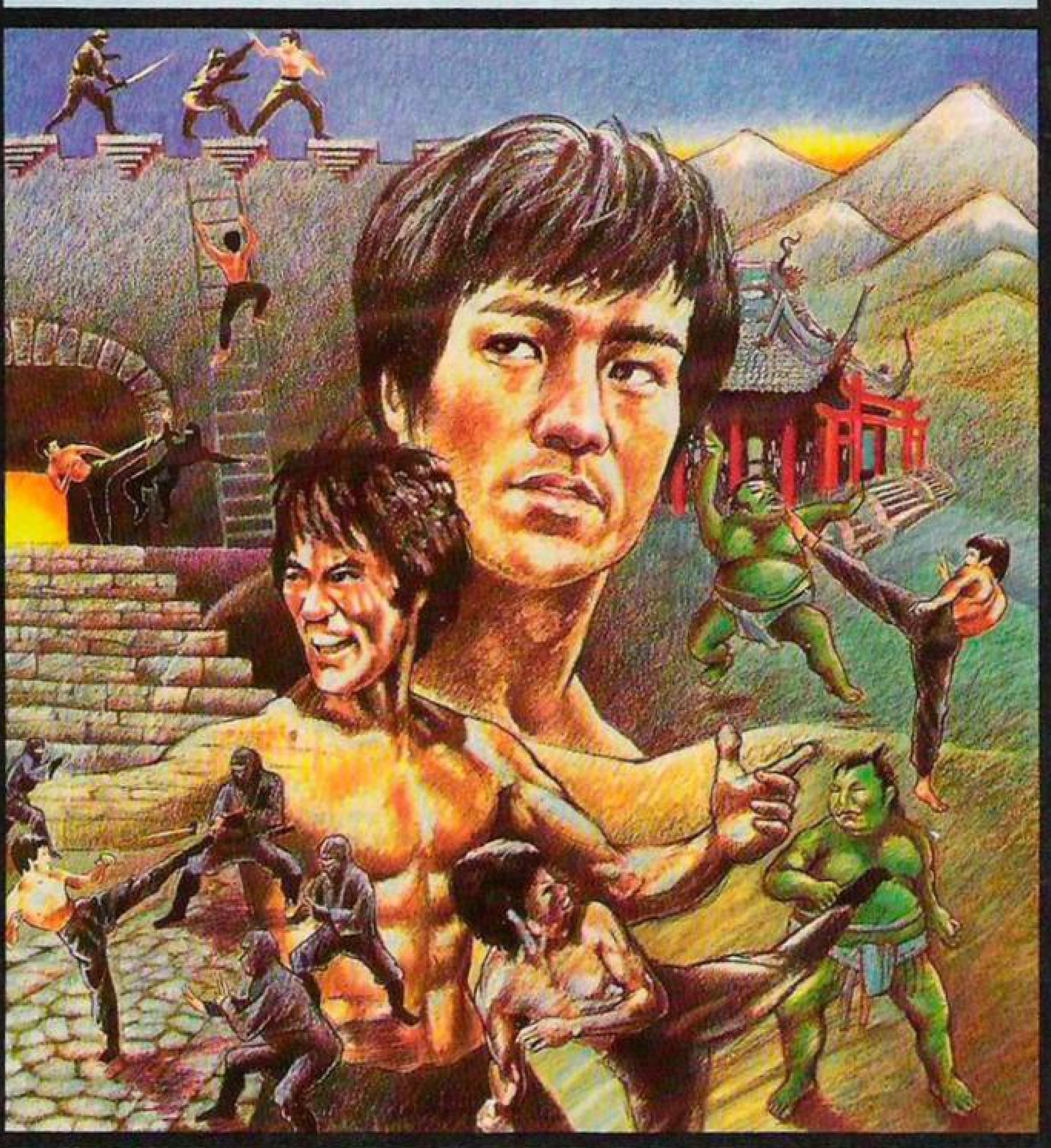
A header showing an ID of 3 is most likely to be a machine-code program. Use Method 2 again. An ID of 4 is the one you get when the program was saved using Method 1, therefore use Method 1 header and load. These are the ID's you will come across using this program. ID's of 2, indicating the start of a data set — Method 1 — and 5, indicating an End of Tape signal also occur.

If you cannot face typing in all the program, a cassette containing this and the screen save facility, is available from: P and D Computers, 80 Coombe Park Road, Coventry CV3 2PE at a cost of £3.50 including P&P.

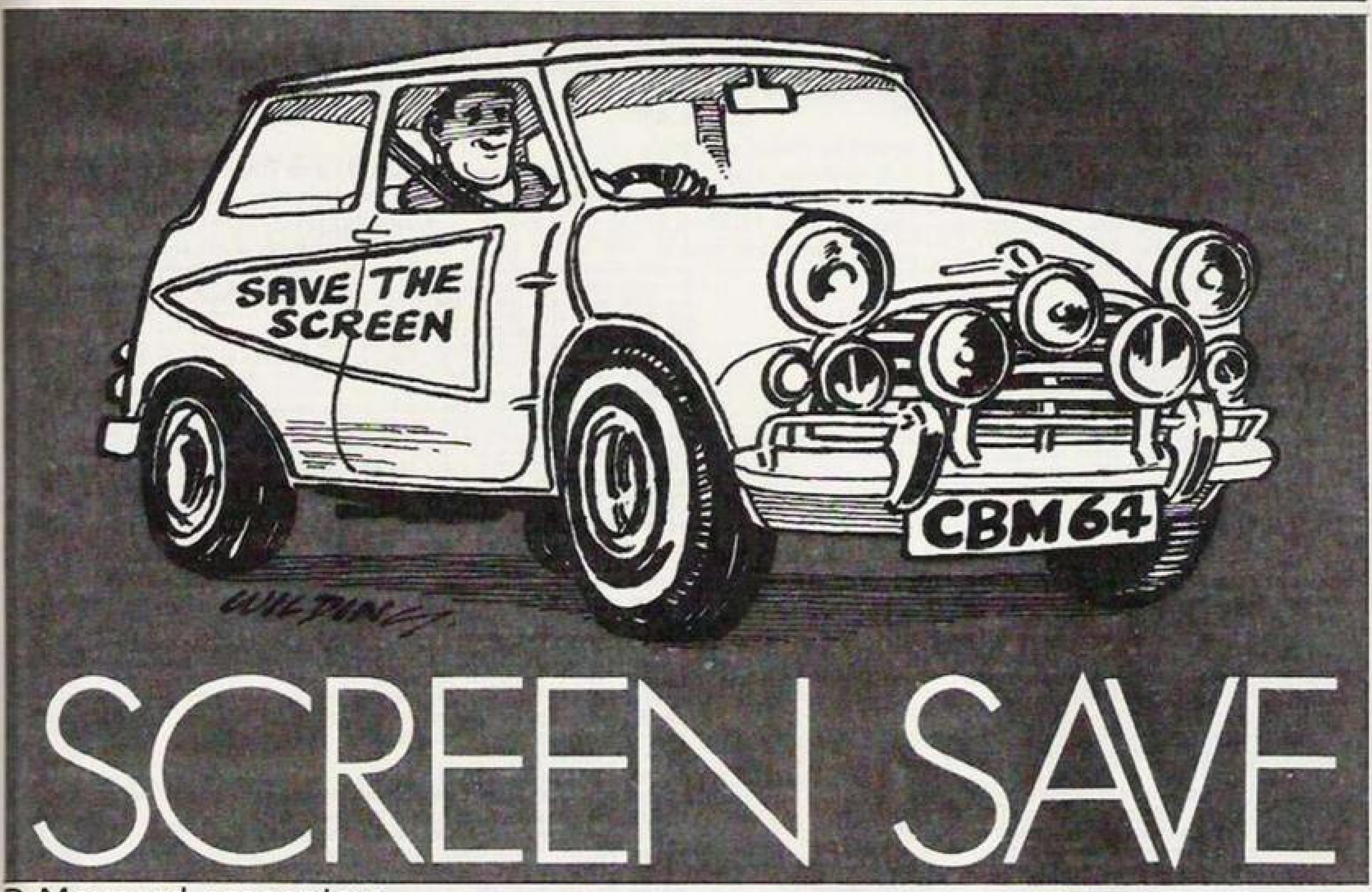
```
1 REM *******************
2 REM **  MC MANAGER  **
3 REM ** BY D M BROWN **
4 REM **    © 1984    **
5 REM *******************
10 POKE 53280,11: POKE 53281,7: PRINT "□"
11 RESTORE
12 FOR I=49156 TO 49216: READ D: POKE I,D:NEXT I
15 DEFFN HEX(I) = (I AND 15)+48-((I AND 15)>9)*7
16 DEFFN DEC(I) = I-48+(I>57)*7
20 PRINT "□";TAB(16)"MENU" :PRINT
30 PRINT TAB(13)"1. SAVE"
40 PRINT TAB(13)"2. LOAD"
50 PRINT TAB(13)"3. HEX TO DEC"
60 PRINT TAB(13)"4. DEC TO HEX"
62 PRINT TAB(13)"5. HEADER"
65 PRINT TAB(13)"6. FREE BYTES"
70 PRINT TAB(13)"7. EXIT"
80 INPUT "NUMBER OF FACILITY REQUIRED";N
90 ON N GOTO 200,400,600,800,1450,1300,1000
200 REM ***SAVE ROUTINE***
202 PRINT"□":INPUT "SAVE METHOD 1 OR 2";M
204 IF M=2 THEN 1100
206 PRINT"METHOD 1 SAVE":F$=""
210 INPUT "FILE NAME ";F$:L=LEN(F$)
220 IF L>16 THEN PRINT "NAME TOO LONG":STOP
230 PRINT: INPUT "START ADDRESS";SA
250 PRINT: INPUT "FINISH ADDRESS ";FA
260 IF FA<SA THEN PRINT"ADDRESS WRONG":FORI=0TO2000:NEXT:GOTO10
270 PRINT: OPEN 1,1,2,F$: PRINT#1,SA:PRINT#1,FA
280 FOR I=SA TO FA: PRINT#1,PEEK(I):NEXT
290 PRINT#1:CLOSE 1: GOTO 20
400 REM ***LOAD ROUTINE***
402 PRINT"□":INPUT"LOAD METHOD 1 OR 2";M
404 IF M=2 THEN 1400
510 PRINT"METHOD 1 LOAD"
520 OPEN1,1,0: INPUT#1,SA,FA:IF ST THEN PRINT"TAPE ERROR":STOP
530 FOR I=SA TO FA :INPUT#1,P: POKE I,P:NEXTI:CLOSE 1
540 PRINT TAB(14) "LOAD COMPLETE"
550 FOR I=1 TO 2000:NEXT:GOTO 20
600 REM ***HEX TO DEC ROUTINE***
605 PRINT"ENTER 0 TO EXIT. (DEC 0 = HEX 0)"
610 INPUT "HEX NUMBER";H$
620 GOSUB 700
625 IF D=0 THEN 20
626 FORI=1TO4:IF ASC(MID$(H$,I,1))>70THEN PRINT"HEX NUMBER WRONG":STOP
627 NEXT I:IF LEN(H$)<4 THEN H$=CHR$(48)+H$:GOTO 626
630 PRINT "HEX ";H$;" = DEC ";D:GOSUB 1700 :GOTO 600
700 REM ***HEX/DEC S/ROUTINE***
710 D=0: FOR I=1 TO LEN(H$)
720 E = FNDEC (ASC(MID$(H$,I,1))):D=D*16+E: NEXTI
730 RETURN
800 REM ***DEC TO HEX ROUTINE***
805 PRINT"ENTER 0 TO EXIT. (HEX 0 = DEC 0)"
810 INPUT "DECIMAL NUMBER";D
815 IF D>65535 THEN PRINT"NUMBER TOO LARGE":STOP
820 GOSUB 900
825 IF D=0 THEN 20
830 PRINT "DEC ";D;" = HEX ";H$
840 GOSUB 1700
860 GOTO 800
900 REM ***DEC TO HEX S/ROUTINE***
910 E=D: H$=""
920 H$=CHR$(FNHEX(E-INT(E/16)*16))+H$
930 E=INT(E/16): IF E>0 THEN 920
940 RETURN
1000 REM ***EXIT***
1010 END
1100 REM ***METHOD 2 SAVE ROUTINE***
1105 PRINT"METHOD 2 SAVE":N$=""
1110 INPUT "FILE NAME";N$
1115 PRINT:L=LEN(N$):IFL>16THEN PRINT "NAME TOO LONG":STOP
1120 FOR I=49231 TO 49246:POKEI,32:NEXT
1130 POKE 49230,L
1140 IF L=0 THEN 1145
1142 FOR I= 1 TO L:POKE 49230+I,ASC(MID$(N$,I,1)):NEXT
1145 PRINT
1150 INPUT "START ADDRESS";S:PRINT
1160 POKE49153,INT(S/256):POKE49152,S-INT(S/256)*256
1180 INPUT "FINISH ADDRESS";F:PRINT
1185 IF F<S THEN PRINT"ADDRESS WRONG":STOP
1190 POKE49154,F-INT(F/256)*256
1200 POKE49155,INT(F/256)
1210 SYS49156
1220 GOTO20
1300 REM *** FREE BYTES ROUTINE ***
1310 PRINT"FREE BYTES = ";FRE(0)-(FRE(0)<0)*65536
1320 GOSUB 1700
1340 GOTO 20
1400 REM ***METHOD 2 LOAD ROUTINE***
1410 PRINT"METHOD 2 LOAD":SYS49197
1420 PRINT TAB 15, "LOAD COMPLETE"
1430 FOR I=1 TO 2000:NEXT
1440 GOTO 20
1450 REM ***HEADER ROUTINE***
1460 PRINT"□":INPUT"METHOD 1 OR METHOD 2";M
1470 GOSUB1600
1490 PRINT"I.D.          = ";ID
1491 PRINT"START ADDRESS = ";SA
1492 PRINT"END ADDRESS   = ";FA
1494 PRINT"FILE NAME     = ";N$
1496 IF PEEK(B+5)=32 THEN PRINT "NO NAME FOUND"
1497 GOSUB 1700
1498 GOTO 20
1499 REM *** DATA FOR MACHINE CODE ***
1500 DATA 162,1,169,1,160,7,32,186,255,173,78,192,162,79,160,192,32,189,255,173
1510 DATA 0,192,133,20,173,1,192,133,21,174,2,192,172,3,192
1520 DATA 169,20,32,216,255,96
1530 DATA 160,1,169,1,162,1,32,186,255,169,0,32,189,255,169,0,32,213,255,96
1600 REM ***HEADER SUBROUTINE***
1610 PRINT"METHOD";M;"HEADER":B=828:N$=""
1620 OPEN 1
1630 ID = PEEK(B): SA=PEEK(B+1)+256*PEEK(B+2): FA=PEEK(B+3)+256*PEEK(B+4)
1640 FOR I=B+5 TO B+20:N$=N$+CHR$(PEEK(I)): NEXT
1645 IF M=1 THEN INPUT#1,SA,FA: IF ST THEN PRINT "TAPE ERROR": STOP
1650 CLOSE 1
1660 RETURN
1700 REM ***WAIT FOR KEY SUBROUTINE***
1710 PRINT"PRESS ANY KEY TO CONTINUE"
1720 GET A$: IF A$="" THEN 1720
1730 RETURN
```

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SCREEN SAVE

D Maynard presents a program which allows you to save what is on your tv screen.

THIS PROGRAM allows you to save what is on the monitor or television screen of your Commodore 64 and load it back at a later stage. All colours and characters are saved. All the VIC registers are saved.

The problem with saving a screen is that the tape operating instructions corrupt what is there. We therefore have to save the screen information into an area of memory that is not corrupted. This is done in a machine-code routine and another machine-code routine then saves this area of memory to tape. Although the tape operating instructions appear on the screen they are not saved.

In the load condition the screen data is loaded from tape into an area of memory and then transferred into video memory. In order to reproduce the whole screen and prevent the "Ready" signal appearing, the program is looped so that the "Ready" signal does not appear until a key is pressed.

The program is in two parts. Lines up to 190 are necessary to load the data into memory for the machine code routines. When this is run the lines are removed by the New statement in line 190. Then lines 60000 on are entered together with the program that produces the screen to be saved. If you change line 60120 to Return a member of screens can be saved using

GOSUB 60000

When the program runs, nothing happens!

This is because it is waiting for you to press S for save or L for load. No prompts are given because they would appear across the screen you are trying to save. When you press S the prompt Press Record and Play on Tape appears.

Saved to another area

In the instant between pressing S and the prompt appearing all of the screen and colour memory has been saved to another area of memory. The memory map of this area is shown in figure 1. When you press Play and Record the screen data is transferred from the new location to tape.

If, after running the program you press L the press play on tape prompt appears and the data can then be loaded from tape into memory and afterwards transferred to screen

(continued on next page)

Figure 1: New Screen Memory Area.

Dec	Hex	Description
50944	C700	Screen Ram location LO
50945	C701	Screen Ram location HI
50946	C702	Current character colour code
50947	C703	Colour under cursor
50948	C704	Top of screen memory
50949–	C705–	Screen character memory
51972	CB04	Screen character memory
51973–52018	CB05–CB32	Vicchip registers
52019–53019	CB33–CF1B	Colour memory

Figure 2: Memory Map — Screen Save

Dec	Hex	Description
49152	C000	Start LO
49153	C001	Start HI
49154	C002	End LO
49155	C003	End HI
49156–49196	C004–C02C	Save routine
49197–49216	C02D–C040	Load routine
49217–49229	C041–C04D	Unallocated
49230	C04E	File name length
49231–49246	C04F–C05E	File name
49248–49387	C060–C0EB	Screen save routine
49392–49512	C0F0–C168	Screen load routine

(continued from previous page)

memory. When you wish to continue press any key and the Ready prompt will appear. The last screen saved or loaded can always be recalled to the screen using

SYS 49395

If you wish to save sprite data it is necessary to save the area of memory where the data resides. This must be done so that when you wish to recall the screen you must first load the sprite data. When saving you are prompted to provide a file name, a start address (decimal) and a finish address of the area in memory to be saved. Use

RUN 60200

to save an area of memory.

A problem may arise if the program generating the screen to be saved occupies locations from 49152 to 49512 or 50944 to 53019. These are used by the screen save routine. When relocating the machine code the bytes that are underlined will need changing. In the program, bytes 49152 to 49155 (C000 to C003 hex) are used as stores. The relocation must allow space for these four bytes.

Figure 2 gives the memory map of all machine code routines and registers.

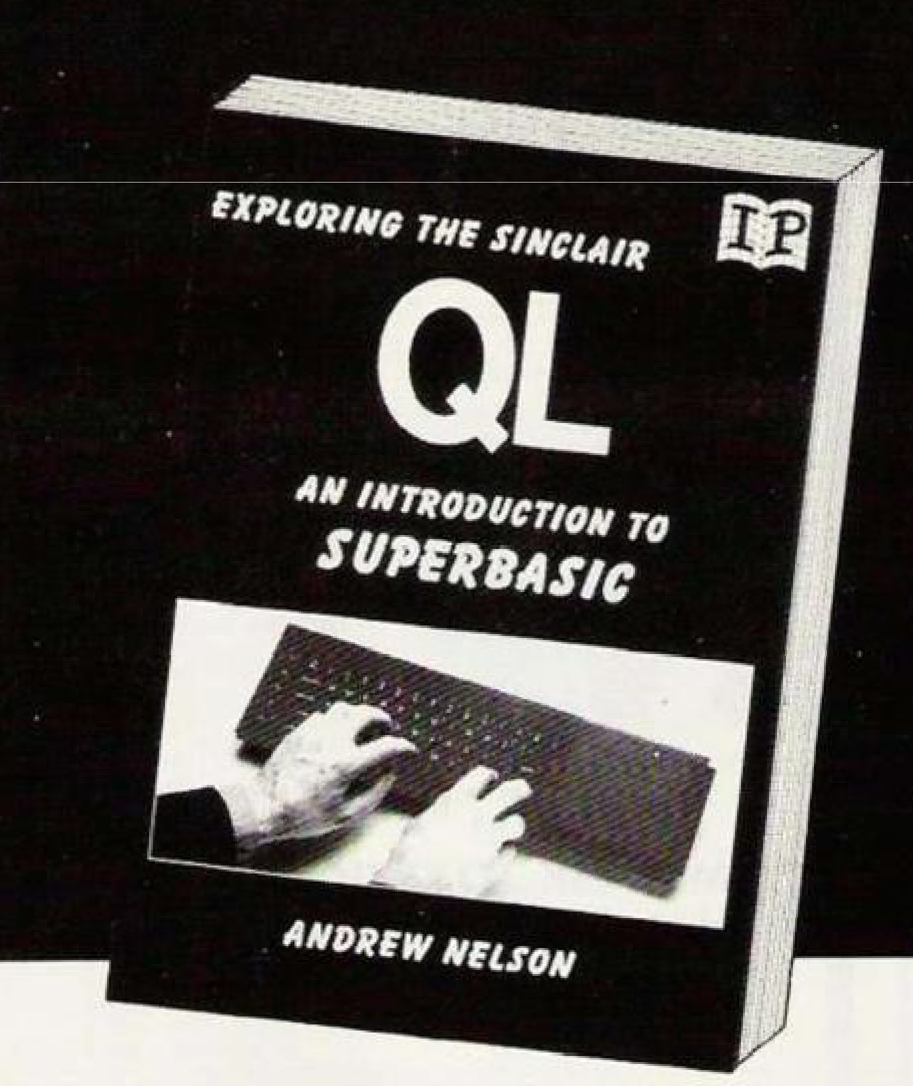
Remember to save lines up to 190 first, then lines 60000 onwards afterwards. ■

```
10 REM ************************
20 REM ***   DATASCREEN     ***
30 REM ***       BY         ***
40 REM ***   D MAYNARD      ***
50 REM ***      1984        ***
60 REM ************************
100 RESTORE:PRINT"": C=0
110 FOR I=49156 TO 49216:READ D:POKE I,D:C=C+D:NEXT
120 IF C<>7419 THEN PRINT"DATA IN LINES 200 TO 230 INCORRECT":STOP
130 C=0
140 FOR I=49248 TO 49387: READ D:POKE I,D:C=C+D:NEXT
150 IF C<>19316 THEN PRINT "DATA IN LINES 230 TO 310 INCORRECT":STOP
160 C=0
170 FOR I=49392 TO 49512:READ D:POKE I,D:C=C+D:NEXT
180 IF C<>17317 THEN PRINT "DATA IN LINES 310 TO 370 INCORRECT":STOP
190 PRINT"DATA LOADED":NEW
200 DATA 162,1,169,1,160,3,32,186,255,173,78,192,162,79,160,192,32,189
210 DATA 255,173,0,192,133,20,173,1,192,133,21,174,2,192,172,3,192,169
220 DATA 20,32,216,255,96,162,1,169,1,160,1,32,186,255,169,0,32,189
230 DATA 255,169,0,32,213,255,96,165,243,141,0,199,165,244,133,4,173,134
240 DATA 2,141,2,199,173,135,2,141,3,199,173,136,2,141,4,199,162,0
250 DATA 189,0,4,157,5,199,232,208,247,189,0,5,157,5,200,232,208,247
260 DATA 189,0,6,157,5,201,232,208,247,189,0,7,157,5,202,232,208,247
270 DATA 189,0,208,157,5,203,232,224,46,208,245,162,0,189,0,216,157,51
280 DATA 203,232,208,247,189,0,217,157,51,204,232,208,247,189,0,218,157,51
290 DATA 205,232,208,247,189,0,219,157,51,206,232,224,232,208,245,169,0,141
300 DATA 0,192,169,199,141,1,192,169,27,141,2,192,169,4,141,3,192,32
310 DATA 4,192,96,32,45,192,173,0,199,133,243,173,1,199,133,244,173,2
320 DATA 199,141,134,2,173,3,199,141,135,2,173,4,199,141,136,2,162,0
330 DATA 189,5,199,157,0,4,232,208,247,189,5,200,157,0,5,232,208,247
340 DATA 189,5,201,157,0,6,232,208,247,189,5,202,157,0,7,232,208,247
350 DATA 189,5,203,157,0,208,232,224,46,208,245,162,0,189,51,203,157,0
360 DATA 216,232,208,247,189,51,204,157,0,217,232,208,247,189,51,205,157,0
370 DATA 218,232,208,247,189,51,206,157,0,219,232,224,232,208,245,96
```

```
60000 REM ***************************
60001 REM *** SCREEN SAVE/LOAD ***
60002 REM ***  BY D. MAYNARD    ***
60003 REM ***      1984         ***
60004 REM ***************************
60010 GET A$:IF A$<>"S" AND A$<>"L" THEN60010
60020 IF A$="L" THEN 60100
60030 SYS49248:STOP
60100 SYS49392
60110 GET A$: IF A$="" THEN 60110
60120 STOP
60200 REM ****************************
60201 REM *** MEMORY SAVE ROUTINE ***
60202 REM ****************************
60210 PRINT"MEMORY SAVE":N$=""
60220 INPUT"FILE NAME";N$
60230 PRINT:L=LEN(N$):IF L>16 THEN PRINT"NAME
      TOO LONG":STOP
60240 FOR I=49231 TO 49246: POKE I,32: NEXT
60250 POKE 49230,L:IF L=0 THEN 60270
60260 FOR I=1 TO L:POKE 49230+I,ASC(MID$(N$,I,1)):NEXT
60270 PRINT
60280 INPUT "START ADDRESS";S:PRINT
60290 POKE 49153,INT(S/256):POKE 49152,S-INT(S/256)*256
60300 INPUT "FINISH ADDRESS";F
60310 IF S>F THEN PRINT"ADDRESS WRONG":STOP
60320 POKE 49154,F-INT(F/256)*256
60330 POKE 49155,INT(F/256)
60340 SYS49156
60350 RETURN
60400 REM ****************************
60401 REM *** MEMORY LOAD ROUTINE ***
60402 REM ****************************
60410 PRINT "MEMORY LOAD"
60420 SYS49197
60430 PRINT TAB 15 ;"LOAD COMPLETE"
60450 FOR I=0 TO 2000: NEXT
60460 RETURN
```

TWO GREATS FOR THE SINCLAIR QL





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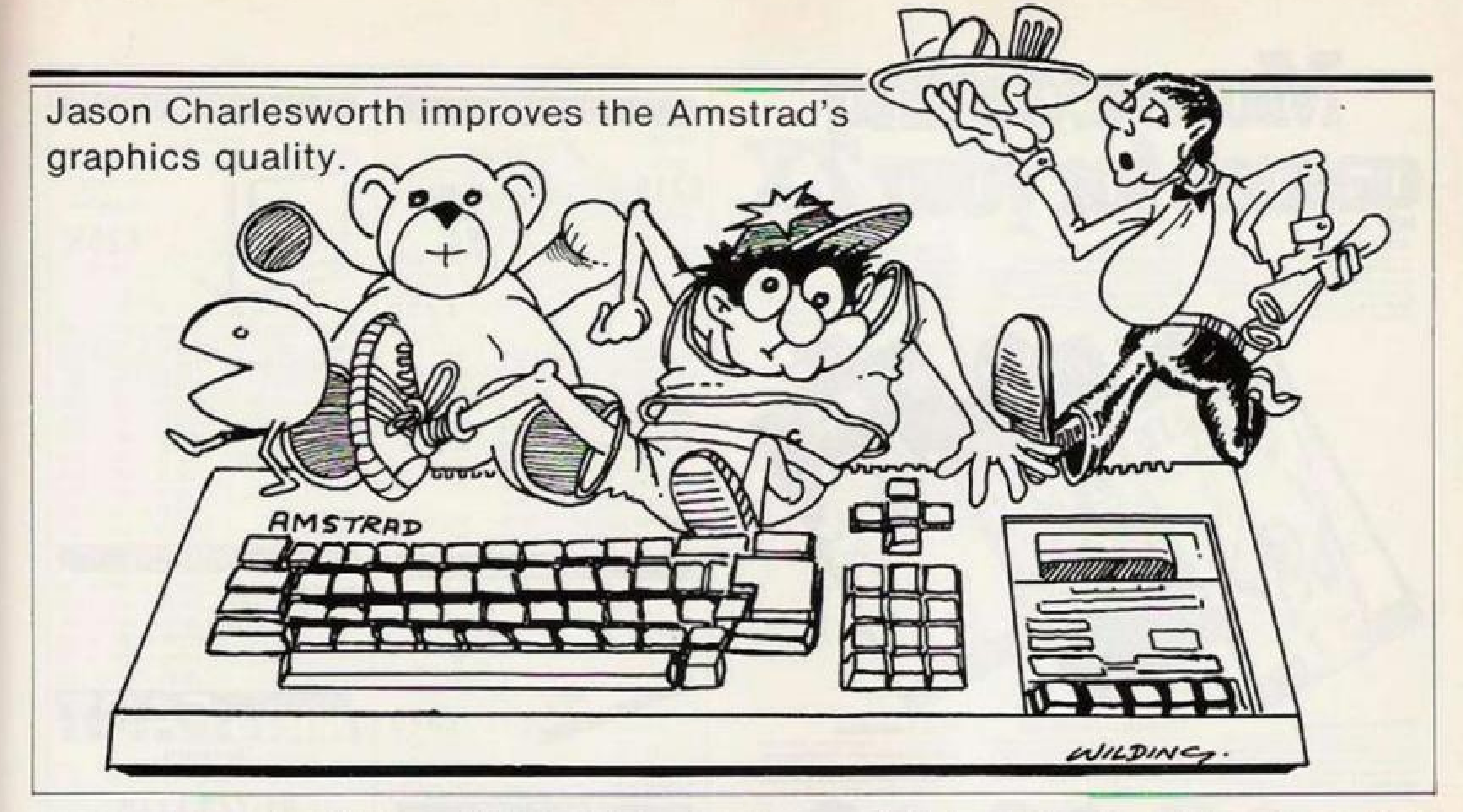
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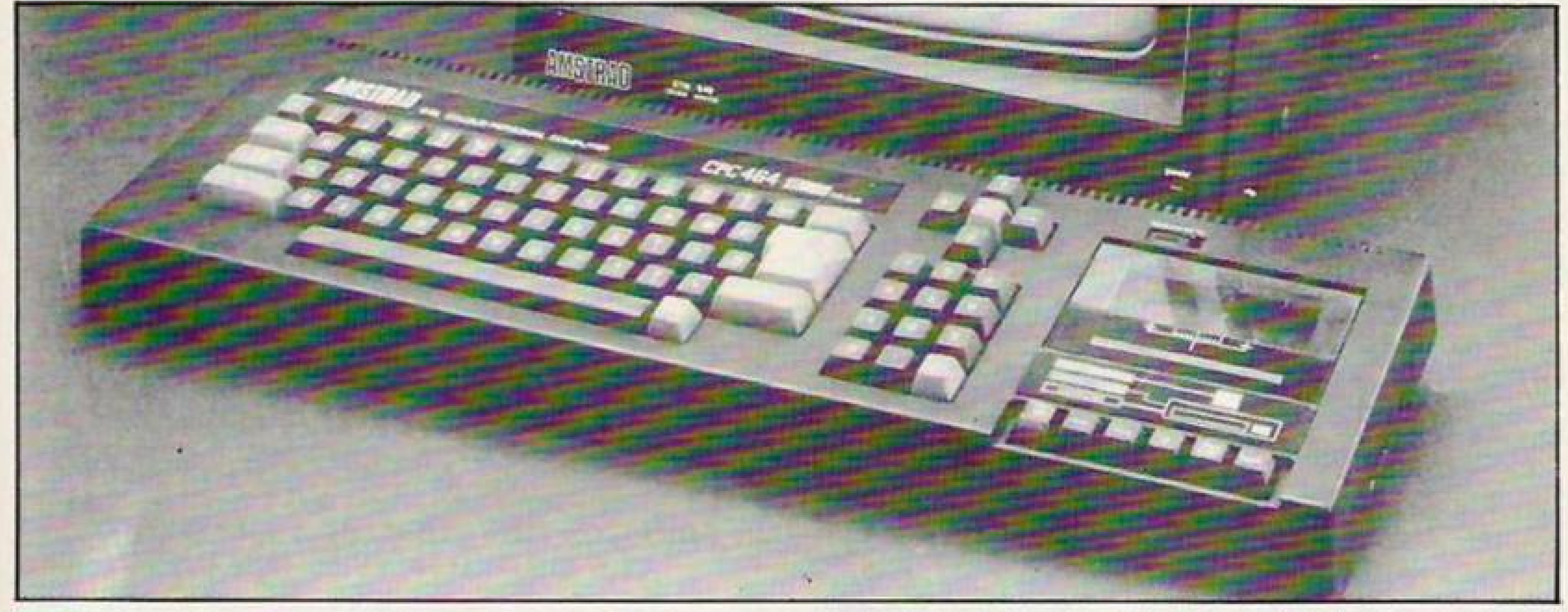
AMSTRAD SPRITES

THE AMSTRAD is a very well designed computer which is extremely strong in all areas except that of graphics. It has the usual Plot and Draw commands but does not contain any sprite routines, Fill commands or Scroll command unlike most recent computers. This article should rectify this by adding five new Basic commands to Amstrad Basic. These are actually new commands, not just a sequence of Pokes and Calls.

Listing 1, when entered and run will provide these commands but before the commands can be used they must be activated by Call 37000. The commands provided are:

SPRITEON,X,Y,Z — This works only in mode 0. X is the X axis co-ord (0-143) and Y is the Y axis — top = 0, bottom = 183 — and Z is the Sprite number — 1 to 15. If any of these are out of range, the routine will return, having done nothing.

(continued on page 147)



Listing 1.

```
10 MEMORY 36999
20 CLS:PRINT "Poking in progress,do not disturb !"
30 x=37000:RESTORE
40 READ a$:IF a$="9999" THEN GOTO 80
50 FOR a=1 TO LEN (a$) STEP 2:POKE x,VAL("&"+MID$(a$,a
,2))
60 x=x+1:NEXT a
70 GOTO 40
80 CLS:PRINT "Finished"
90 DATA 0192902 1C890CDD1BCC9A390C3D090C35091C35891C345
92C35192535052495445 4FCE5350524954
100 DATA 454F46C646494CCC5343524F4C4CD55343524F4C4CC40
0000000929000000000DD7E00DD4602DD4E
110 DATA 04FE00C8FE10D03D6770FEB9D079FE91D07C87878876
F117C9219E53EC7906F5997675779E60120
120 DATA 1ACD1DBC545DE13E10F5D5010800EDB0D1EBCD26BCEBF
13D20EFC9CD1DBC545DE1D51180001 9D13E
130 DATA 10F5D51AE6AA4F7EE6558112231301070 0EDB01AE6554
F7EE6AAB11223D1EBCD26BCEBF13D20DAC9
140 DATA 3E0FDD4600DD4E02C3E090DD7E00FE10D04FDD6603DD6
E027CFE0238047DFE90D0DD5605DD5E047A
150 DATA FE0338047BFE80D079F5
160 DATA CD11BCFE0020020E04FE0120020E02FE0220020E01060
0CDE1BB322B92F1CDDEBBE5CDC491CDE991
170 DATA CD139220F5E1CD2D922008CDC491CDE99118F33A2B92C
DDEDBC9E5D5E5D5C5CDF08BC1D1E1FE0020
180 DATA 13E5D5C5CDEABBC1D1E1EBA7ED42EB7AFEFF20E0D1E1C
9E5D5EB09EB7AFE0220057BFE803010E5D5
190 DATA C5CDF0BBC1D1E1FE00200BE5D5C5CDEABBC1D1E118DBD
1E1C92B2B7CFEFF280CE5D5C5CDF0BBC1D1
200 DATA E1FE00C93E03FE04C9010023237CFE0120057DFE8F30E
DE5D5C5CDF0BBC1D1E1FE00C90601CD99BB
210 DATA CD2CBCCD4DBCC90600 10F2000000000000000000000000
000000000000000000000000000000000000
220 DATA 000000000000000000000000
230 DATA 9999
```



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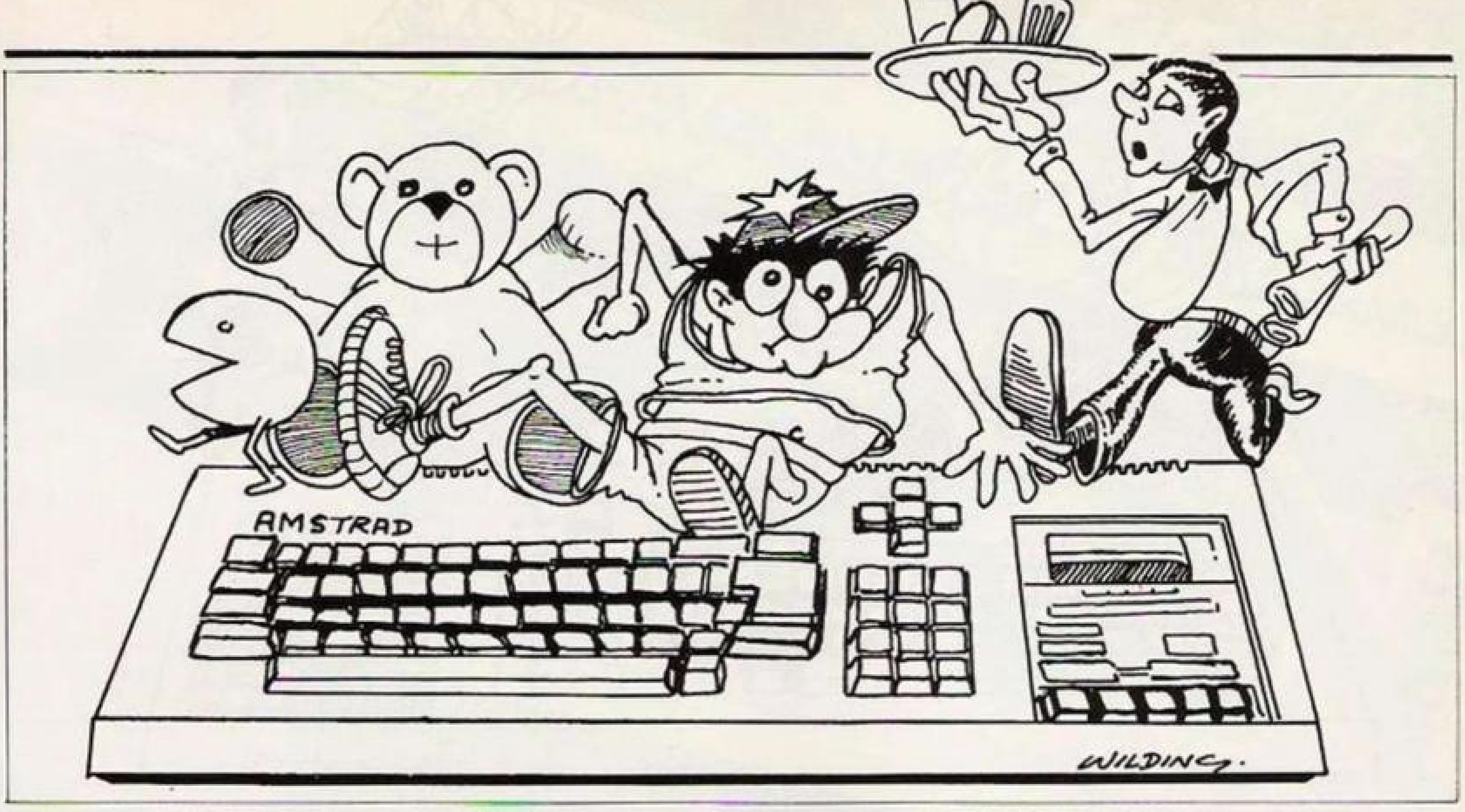
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(continued from page 145)

SPRITEOFF,X,Y — This is the same as for Spriteon except that as it removes a Sprite instead of printing it, no sprite number is needed. FILL,X,Y,Z — X = X co-ord and Y = Y co-ord using normal co-ordinates. Z = pen in which the filling is to be done. This works on any mode.

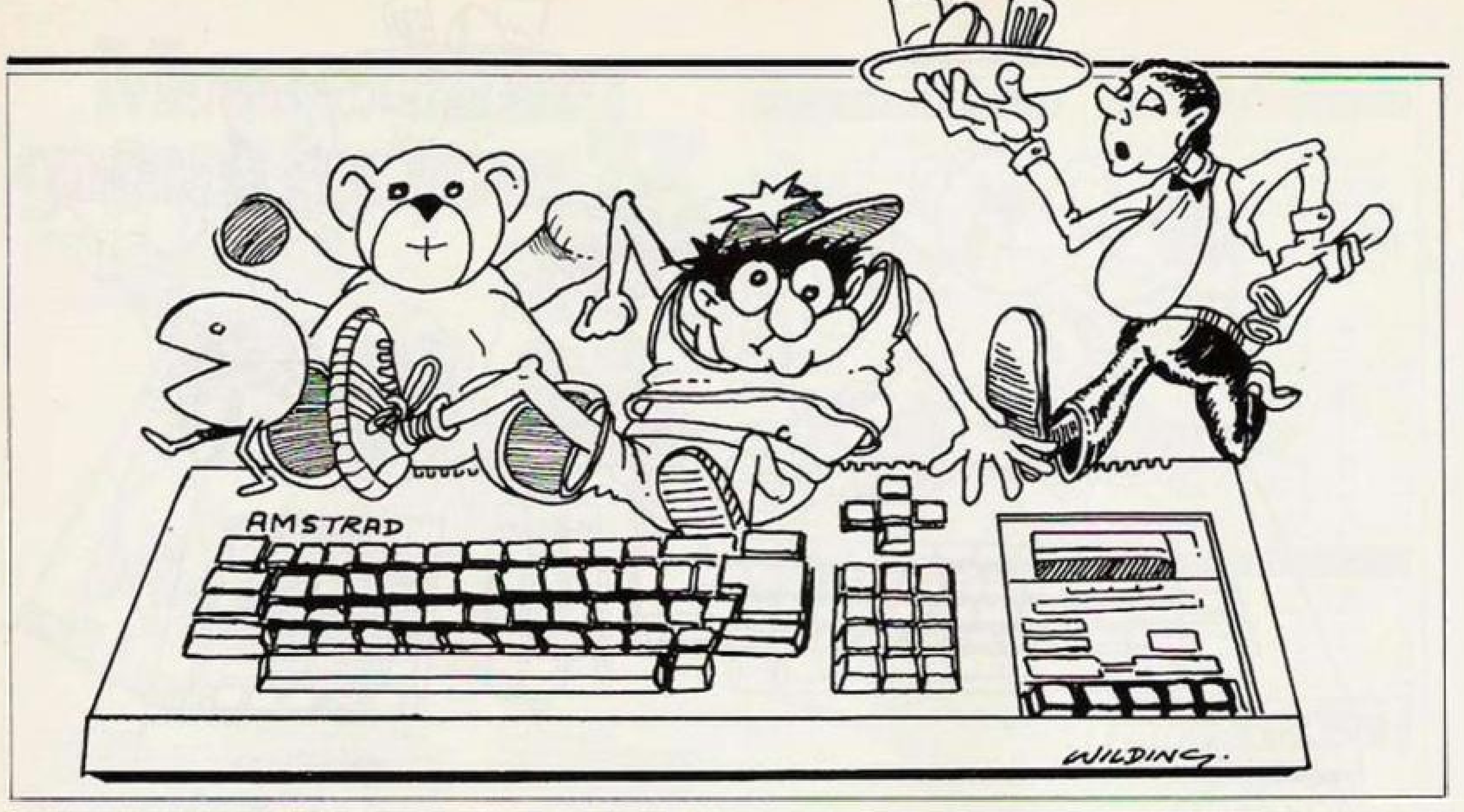
SCROLLU — This scrolls the screen up one line.

SCROLLD — This scrolls the screen down one line. All the commands need to be prefixed by the extended colon — character above the @ on the keyboard. This is the

(continued on next page)

Listing 2.

```
10 MODE 1:INK 1,13:INK 0,1:PAPER 0:PEN 1
20 MEMORY 36999
30 PRINT"Sprite designer by J.Charlesworth":LOCATE 1,1
0
40 INPUT "How many sprites (1 to 15) ",spr
50 IF spr<>INT(ABS(spr)) OR spr>15 OR spr<1 THEN 40
60 spr=spr-1:DIM sp%(spr,15,15)
70 KEY DEF 72,1,&F0,&F4,&F8
80 KEY DEF 75,1,&F3,&F7,&FB
90 KEY DEF 73,1,&F1,&F5,&F9
100 KEY DEF 74,1,&F2,&F6,&FA
110 KEY DEF 76,1,&E0,&E0,&E0
120 tsp=0:pn=1:xp=0:yp=0:GOSUB 550
130 GOSUB 490:GOSUB 140:GOTO 130
140 REM KEYSCAN
150 IF INKEY(62)=0 THEN 280
160 IF INKEY(27)=0 THEN 320
170 IF INKEY(60)=0 THEN 360
180 IF INKEY(46)=0 THEN 400
190 IF INKEY(35)=0 THEN 440
200 a$=INKEY$:IF a$="" THEN RETURN
210 IF a$<>CHR$(&E0) THEN 250
220 IF sp%(tsp,xp,yp)=0 THEN sp%(tsp,xp,yp)=pn:GOTO 24
0
230 sp%(tsp,xp,yp)=0
240 GOSUB 520:RETURN
250 x=xp+(a$=CHR$(&F2))-(a$=CHR$(&F3)):y=yp+(a$=CHR$(&
F1))-(a$=CHR$(&F0))
260 IF x>15 OR y>15 OR x<0 OR y<0 THEN RETURN
270 GOSUB 520:xp=x:yp=y:RETURN
280 REM CLEAR
290 a$=INKEY$
300 CLS#1:INPUT #1,"Confirm (y or n) ";a$:IF a$<>"y" T
HEN GOSUB 770:RETURN
310 FOR a=0 TO 15:FOR b=0 TO 15:sp%(tsp,a,b)=0:NEXT b:
NEXT a:GOSUB 550:GOSUB 740:RETURN
320 REM PEN
330 a$=INKEY$
340 CLS#1:INPUT#1,"Which ink";a:IF a>15 OR a<0 OR a<>I
NT(ABS(a)) THEN 340
350 pn=a:GOSUB 770:LOCATE 8,8:PAPER pn:PRINT" ":PAPER
0:RETURN
360 REM SAVE
370 GOSUB 780
380 SAVE "spritecode",b,37500,4352
390 RETURN
400 REM SPRITE
410 a$=INKEY$
420 CLS#1:INPUT #1,"sprite ";a:a=a-1:IF a>spr OR a<0 O
R a<>INT(ABS(a)) THEN 400
430 tsp=a:GOSUB 550:GOSUB 740:RETURN
440 REM INK
450 a$=INKEY$
460 CLS#1:INPUT#1,"Ink ";a:INPUT #1,"New colour ";b
470 IF a>15 OR a<0 OR a<>INT(ABS(a)) OR b>26 OR b<0 OR
 b<>INT(ABS(b)) THEN 460
480 INK a,b:GOSUB 770:RETURN
490 REM PCURSER
500 PLOT xp*16+4,yp*16+2,1:DRAWR 8,12:PLOT xp*16+12,yp
*16+2:DRAWR -8,12
510 RETURN
520 REM PSPLOT
530 FOR a=4 TO 12 STEP 4:PLOT a+xp*16,yp*16+2,sp%(tsp,
xp,yp):DRAWR 0,12:NEXT a
540 PLOT 304+4*xp,272+2*yp:RETURN
550 REM SCREEN
560 MODE 0
570 FOR a=0 TO 256 STEP 16
580 PLOT a,0,1:DRAWR 0,256
590 PLOT 0,a:DRAWR 256,0
600 NEXT a
610 FOR a=0 TO 15:LOCATE 14,a+9
620 PRINT a:PAPER a:LOCATE 18,a+9:PRINT"  ":PAPER 0
630 NEXT a
640 LOCATE 15,7:PRINT"Inks"
650 PLOT 639,0:DRAW 639,316
660 DRAW 416,316:DRAW 416,0
670 DRAW 639,0
680 WINDOW#1,2,19,2,4
690 PLOT 0,399:DRAW 639,399:DRAW 639,320
700 DRAW 0,320:DRAW 0,399
710 GOSUB 770
720 LOCATE 1,7:PRINT"Sprite";tsp+1:PRINT"Pen     ";:PAP
ER pn:PRINT" ":PAPER 0
730 RETURN
740 x=xp:y=yp:FOR xp=0 TO 15:FOR yp=0 TO 15:IF sp%(tsp
,xp,yp) THEN GOSUB 520
750 NEXT yp:NEXT xp
760 xp=x:yp=y:RETURN
770 PRINT#1,"P Pen       C ClearS Save","N Sprite   I I
nk":RETURN
780 'compile
790 FOR a=0 TO spr:CLS:PRINT:PRINT:PRINT:PRINT"COMPILI
NG IN":PRINT"PROGRESS"
800 FOR b=0 TO 15:FOR c=0 TO 15:PLOT 4*b,368+2*c,sp%(a
,b,c):PLOT 4*b+101,368+2*c,sp%(a,b,c):NEXT c:NEXT b
810 FOR c=0 TO 7:FOR b=0 TO 7:POKE 37500+272*a+b+8*c,P
EEK(49152+b+2048*c):NEXT b:NEXT c
820 FOR c=0 TO 7:FOR b=0 TO 7:POKE 37500+272*a+b+8*(c+
8),PEEK(49232+b+2048*c):NEXT b:NEXT c
830 FOR c=0 TO 7:FOR b=0 TO 8:POKE 37628+272*a+b+9*c,P
EEK(49164+b+2048*c):NEXT b:NEXT c
840 FOR c=0 TO 7:FOR b=0 TO 8:POKE 37628+272*a+b+9*(c+
8),PEEK(49244+b+2048*c):NEXT b:NEXT c
850 NEXT a
860 FOR a=(SPR+1)*272+37500 TO 41852:POKE A,0:NEXT A
870 RETURN
```



(continued from previous page)
method of telling the Amstrad that the new commands exist.

If you have typed in the run listing 1, save the resultant code with save "commands",b, 37000,500 and any time you need these commands, load them in with memory 36999: Load"":Call37000. The second listing, listing 2 is a sprite editor and this creates the code for the sprite design — without it the first two commands are almost useless.

Type in and run listing 2 and type how many sprites you want to define. You will then be presented with a grid, a list of the colours to one side and a list of the commands at the top. You can move your cursor round the grid — using joystick 1 or cursor keys — and setting or resetting the colour to Pen colour or background colour respectively using the fire or Copy key.

This means pressing the fire or copy key will set a cell to the present pen colour and pressing it again will return the cell to background colour. The commands at the top are:

P — Change the present pen — the colour of the pens are printed to the right of the screen.
I — Change the colour of one of the pen's ink.
N — Start working — or continue working — on another sprite.
C — Clears a sprite and returns to a clear grid.
S — Saves the sprites to tape.

Using all these commands, complex sprites can be designed and saved to tape. In future they may be loaded into memory using Load"" and used by the sprite commands as previously described. The final listing — listing 3 gives a demo of the commands. To run this, type in the program then load in the new commands with Memory 36999:Load"": Call 37000 and then run it.

This demo illustrates how to use all the commands but the most interesting is the sprite demonstration. By using the Amstrad interrupt facility, the Amstrad keeps removing the sprite, moving it a bit then replacing it, animating it. If, however, several sprites are used and/or the amount they move is large the movement is jerky — the first sprite demonstration. However if a limited number of sprites are used and these move perhaps 1 pixel at a time, the movement is very smooth — sprite demonstration 2.

Finally, it should be noted that the Fill and the Spriteon commands assume that the background colour is pen 0 and unpredictable events may occur if this is not so but this should be no major problem as on switching on, the computer immediately makes pen o the paper colour. ■

Listing 3.

```
10 MEMORY 36999:CALL 37000
20 x=37500:PRINT"please wait,poking in progress"
30 READ a$:IF a$="9999" THEN 210
40 FOR a=1 TO LEN(a$) STEP 2:POKE x,VAL("&"+MID$(a$,a,
2)):x=x+1:NEXT
50 GOTO 30
60 DATA 0044CCCCCCCC8800449933333333366889933333333333
669932303132303166993330817230336 6
70 DATA 9933320172313366443333333333333388009933333333366
0000449933336688000000443333880000
80 DATA 0044993333668800000993366993366004433669C6C9933
889933883C3C4433669966001428009966
90 DATA CC8800000000044CC0000CCCCCCCCCC000000CC33333333
33CC0044333333333333333884433303033
100 DATA 3030338844333270338031338844333370338033338800
099333333333336600004433333333338000
110 DATA 0000CC333333CC000000000009933660000000000CC333
333CC00000044333CC3333880000099 33CC
120 DATA 3CCC336600443366143C28993388443388003C0044338
844CC000000000CC88
130 DATA 00000050A000000000000F0F000000000050F0F0A0
0000000055AA50A000000000005AA5000000
140 DATA 00000050A000000000000050A00000000000050A0000
00000F0F0F0F0F00050CCCCCCCCDC26A0
150 DATA E4CCCCCCCCB94CD8E4CCCCCCDC26CCD850CCCCCCB94CC
CA000F0F0F0F0F000003000000000003000
160 DATA 10002000001000200000000000F0000000000000050F0
A00000000000000F0F0F0000000000000FF0
170 DATA 0F00000000000005F00A00000000000000F000000000
0000000F00000000000000000F000000000
180 DATA 0050F0F0F0F0F0A00000E4CCCCCCCCB95800 50CCCCCCC
CDC26CCA050CCCCCCCCB94CCCA000E4CCCC
190 DATA DC26CCD8000050F0F0F0F0F0A0000010200000000010200
000201000000000201000
200 DATA 9999
210 FOR a=41500 TO 41851:POKE a,0:NEXT a
220 MODE 0:a=2:b=40:c=1:p=2:q=100:r=2:x=2:y=140:z=3
230 PRINT"Jerky sprites"
240 EVERY 3,3 GOSUB 260
250 FOR t=0 TO 2000:NEXT t:GOTO 310
260 DI:|SPRITEOFF,x,y:x=x+z:|SPRITEON,x,y,1:|SPRITEOFF
,p,q:p=p+r:|SPRITEON,p,q,2
270 |SPRITEOFF,a,b:a=a+c:|SPRITEON,a,b,1:IF a=142 OR a
=1 THEN c=-c
280 IF p=142 OR p=0 THEN r=-r
290 IF x=143 OR x=2 THEN z=-z
300 EI:RETURN
310 Z=REMAIN(3):DI:CLS:r=1:z=1:y=180:q=60:PRINT"Smooth
 sprites":EI
320 FOR a=0 TO 600:CALL &BD19:GOSUB 390:NEXT a
330 CLS:PRINT"Fill and Scrolling":FOR t=0 TO 5000:NEXT
 t:CLS
340 FOR a=0 TO 640 STEP 40:PLOT a,0:DRAWR 0,400,1:NEXT
350 PLOT 0,0:DRAW 636,0,1:DRAW 636,398,1:DRAW 0,398,1:
DRAW 0,0,1
360 FOR a=0 TO 15:|FILL,a*40+20,200,a:NEXT
370 FOR a=1 TO 24:FOR b=0 TO a:|SCROLLU:NEXT b:FOR b=0
 TO a:|SCROLLD:NEXT b:NEXT a
380 STOP
390 DI:|SPRITEOFF,x,y:x=x+z:|SPRITEON,x,y,1:IF x=0 OR
x=142 THEN z=-z
400 |SPRITEOFF,p,q:p=p+r:|SPRITEON,p,q,2:IF p=0 OR p=1
42 THEN r=-r
410 EI:RETURN
```



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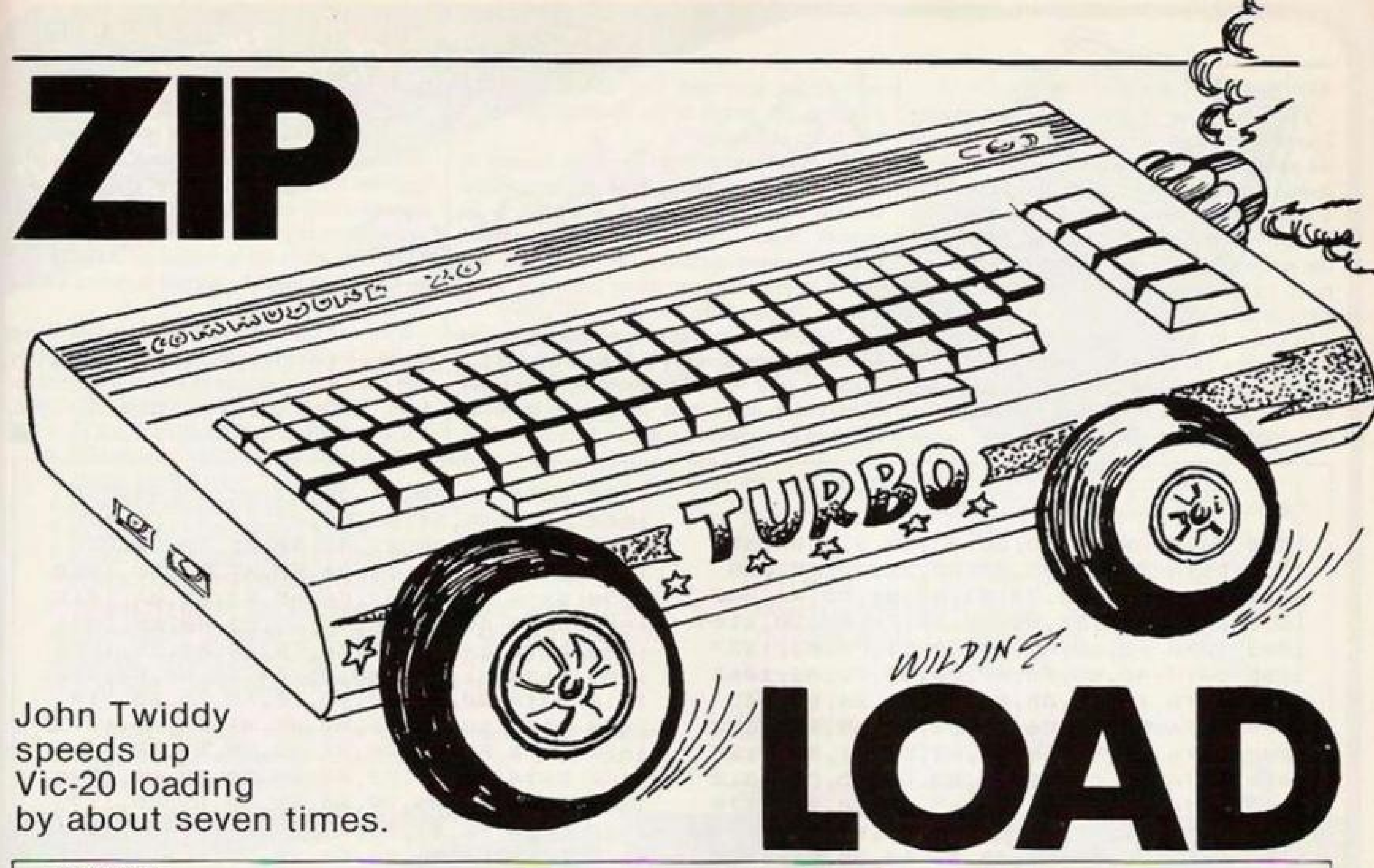
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ZIP LOAD

John Twiddy speeds up Vic-20 loading by about seven times.

Hexloader.

```
100 PRINT"(CLR)(CUR DN)(CUR DN)(CUR DN)(CUR DN)"
105 PRINT"START ADDRESS OF TURBO ";:INPUT S
110 IF S>1023 AND S/256=INT(S/256) THEN 140
120 PRINT"MUST BE AT A MULTIPLE OF 256":GOTO105
140 PRINT"(CUR DN)(CUR DN)":N=Ø:AD=Ø
15Ø T=Ø
16Ø READ A$:IF A$="END" THEN 4ØØ
165 PRINT "(CUR UP)";S+N
17Ø H=ASC(A$)-48:L=ASC(MID$(A$,2))-48
18Ø V=16*(H+7*(H>9))+L+7*(L>9)
185 T=T+V:AD=AD+V
19Ø IF RIGHT$(A$,1)="*" THEN V=V+INT(S/256)
2ØØ POKE S+N,V:N=N+1
21Ø IF N AND 7 THEN 16Ø
22Ø READ TT:IF TT=T THEN 15Ø
23Ø PRINT"CHECKSUM ERROR IN LINE";99Ø+1Ø*N/8
24Ø END
48Ø READ TC:IF TC=AD THEN 5ØØ
49Ø PRINT"OVERALL CHECKSUM ERROR":END
5ØØ READ TN:IF TN=N THEN 52Ø
51Ø PRINT"NOT ENOUGH DATA":END
52Ø PRINT"(CUR DN)(CUR DN)DO YOU WISH TO SAVE IT ?"
53Ø GET A$:IF A$="Y" THEN 56Ø
54Ø IF A$<>"N" THEN 53Ø
55Ø END
56Ø REM SET UP SAVE PARAMETERS
57Ø N$="TURBO"
58Ø FOR I=1 TO LEN(N$)
59Ø POKE 7Ø3+I,ASC(MID$(N$,I)):NEXT
6ØØ POKE 183,LEN(N$)
61Ø POKE 185,1:POKE 186,1
62Ø POKE 187,192:POKE188,2
63Ø POKE 193,S-256*INT(S/256)
64Ø POKE 194,INT(S/256)
65Ø POKE 174,S+N-256*INT((S+N)/256)
66Ø POKE 175,INT((S+N)/256)
67Ø SYS (PEEK(818)+256*PEEK(819))
68Ø END
```

ALL VIC-20 owners will, at one time or another, have envied the loading speed of other computers and more recently the new Turbo load used on some games. It was because of this dramatic difference in speed from the normal cassette operation that I attempted to write my own Zip-loader with the result of a program which will Load and Save reliably at a faster speed than the Commodore disc drive — about seven times faster than normal.

The difference in speed is due to two main factors:

- The data is stored at about 3200 baud compared with the normal rate of 1150 baud.
- No error checking other than a checksum is carried out, hence no redundant data is saved along with the program — unlike the normal situation where sync bits, parity bits, parity bytes and repeat blocks are used.

Despite this lack of error checking and correction, the recording is very reliable and I have yet to get a load or verify error. Since the program records at about 400 bytes a second it is recommended to use fairly high quality cassettes, as you should with all computer programs, because only a little dropout on the tape could render the recording useless.

Once the program has been initialised by a Sys to its start address then the Load, Save and Verify commands make use of the Zip program. The commands operate exactly as normal with the exception that when saving, a secondary address of two does not produce an end of file header. For example:

SAVE "TEST PROGRAM",1,2

has the same effect as

SAVE "TEST PROGRAM",1,1

All the normal error messages remain the same with the exception that if it is unable to understand a file header it gives File Data Error.

The Zip operation will also work with all decent monitors etc. for saving machine code if they use the standard jump vectors.

There are also a few refinements over the normal cassette operation:

- The program flashes the border colour while loading data to indicate error free operation.
- The normal limit of 16 characters for a filename no longer exists and up to 186 are recorded. This may be used to good effect to produce entire title screens from the filename alone.

To enter the program type in listings 1 and 2. Listing 1 is of a hex loader which I would recommend typing in, even if you have a monitor, because it allows you to locate the program anywhere in memory. Recommended places would be 23552 onwards on a Vic-20 with 16K expansion. One word of warning is that the Zip program does not protect itself from being overwritten by your program, variables or strings. Hence, if required, you should move the top of memory pointers down to protect it.

The listings should cause no problem when entering since the Zip program is only about 860 bytes long and each line of data has a checksum which allows the hex loader to identify any errors when it is run. Once the entire program has been typed in, it should be first saved, then run. It will ask for the address where the machine code is to be put and if no errors exist it will give you the option of saving the machine-code Zip program. A Sys to the start address will initialise the Zip program while pressing Run/Stop, and Restore reverts the cassette operation back to its normal slow mode.

(continued on next page)

(continued from previous page)

The functioning of the reading and writing operations require very precise timing, hence the program makes extensive use of the count-down timers which exist in the Vic's VIA. These counters allow you to load them with a two-byte number which is then decremented at the system clock speed — 1MHz — until they reach zero, at which point an interrupt flag is automatically set.

In order to save a program, the Zip-loader first saves a 192 byte header followed by the appropriate block of memory, as does the normal save routine. Within the header is contained the secondary address used when saving, the start and end addresses of the program, the length of the filename and up to 186 bytes of filename.

The header is saved in the same manner as the memory block that follows it. First, several seconds of binary 00001111 is output — 10 seconds before the header and two seconds before the main section — to enable the Zip loader to get into sync when reading it back. This is followed by the bytes $0E,$0D, ... $02,$01,$00. The next byte output is one which indicates whether the data following is a header — $F0 — or the main program — $0F. Next comes the actual data, byte by byte, followed by a checksum digit which is the sum total of all the bytes loaded.

The Zip-loader program can also be used to speed up the loading of most bought software. All that is required is to save each section of the program via Zip and then just set up the Zip prior to trying to load the game. You would, of course, have to put the Zip-loader program in a block of memory not occupied by the game and be able to get past the normal auto-run feature of the game.

If anyone has a problem or query concerning the Zip-loader program, I will quite happily sort them out on receipt of a SAE addressed to: John Twiddy, 65 Holly Avenue, Wallsend, Tyne and Wear. ■

Hex dump.

```
1000 DATA A9,B3,8D,30,03,A9,01*,8D,851
1010 DATA 31,03,A9,22,8D,32,03,A9,618
1020 DATA 00*,8D,33,03,A2,00,BD,9A,700
1030 DATA 01*,F0,06,20,D2,FF,E8,D0,1184
1040 DATA F5,60,A5,BA,C9,01,F0,03,1137
1050 DATA 4C,85,F6,A9,00,85,90,A2,1063
1060 DATA 1E,20,AB,F8,F0,07,20,B7,943
1070 DATA F8,B0,E6,A2,B4,86,A5,20,1327
1080 DATA 28,F7,A0,00,A5,B9,91,B2,1120
1090 DATA A5,C1,C8,91,B2,48,A5,C2,1312
1100 DATA C8,91,B2,48,A5,AE,C8,91,1279
1110 DATA B2,48,A5,AF,C8,91,B2,48,1185
1120 DATA 20,54,F8,A5,B7,A0,05,91,1022
1130 DATA B2,A2,00,A9,20,E4,B7,B0,1128
1140 DATA 0C,88,88,88,88,88,B1,BB,1056
1150 DATA C8,C8,C8,C8,C8,C8,91,B2,1523
1160 DATA E8,C0,BF,90,E6,A5,A5,A2,1481
1170 DATA F0,20,A4,00*,68,85,AF,68,952
1180 DATA 85,AE,68,85,C2,68,85,C1,1168
1190 DATA B0,07,A9,14,A2,0F,20,A4,745
1200 DATA 00*,A9,00,60,85,A5,86,AA,867
1210 DATA 20,60,01*,A5,C1,85,C3,A5,980
1220 DATA C2,85,C4,A9,64,8D,16,91,1100
1230 DATA A9,00,8D,15,91,A9,FF,8D,1041
1240 DATA 26,91,8D,25,91,A9,FF,8D,1071
1250 DATA 25,91,A9,0F,20,28,01*,B0,615
1260 DATA 49,AD,2D,91,29,40,F0,F2,1023
1270 DATA AD,24,91,C6,A5,D0,E6,A2,1317
1280 DATA 0F,8A,20,28,01*,CA,10,F9,693
1290 DATA A5,AA,20,28,01*,A9,00,85,710
1300 DATA BD,A5,C3,C5,AE,D0,06,A5,1299
1310 DATA C4,C5,AF,F0,18,A0,00,B1,1169
1320 DATA C3,48,20,28,01*,68,B0,12,638
1330 DATA 65,BD,85,BD,E6,C3,D0,E1,1470
1340 DATA E6,C4,18,90,DC,A5,BD,20,1200
1350 DATA 28,01*,A5,B4,8D,0F,90,A9,855
1360 DATA 00,8D,A0,02,58,4C,CF,FC,926
1370 DATA A0,08,0A,48,A9,40,2C,1D,556
1380 DATA 91,F0,FB,90,08,A9,0C,85,1102
1390 DATA BE,C6,BE,D0,FC,A9,00,8D,1348
1400 DATA 15,91,AD,20,91,49,08,8D,738
1410 DATA 20,91,29,08,D0,07,20,59,562
1420 DATA 01*,90,D9,68,60,68,88,D0,1010
1430 DATA D1,AD,21,91,49,01,4A,60,804
1440 DATA 78,AD,0F,90,85,B4,AD,1C,966
1450 DATA 91,29,FC,8D,1C,91,A9,F7,1168
1460 DATA 8D,20,91,A9,C0,85,C0,A9,1173
1470 DATA 40,8D,1E,91,A9,42,8D,2E,802
1480 DATA 91,A9,00,8D,1B,91,8D,2B,811
1490 DATA 91,8D,15,91,8D,25,91,A2,937
1500 DATA FF,A0,FF,88,D0,FD,CA,D0,1677
1510 DATA F8,60,93,11,56,49,43,20,766
1520 DATA 54,55,52,42,4F,20,28,43,535
1530 DATA 29,20,4A,2E,54,57,49,44,505
1540 DATA 44,59,00,85,93,A5,BA,C9,989
1550 DATA 01,F0,03,4C,4B,F5,A9,00,809
1560 DATA 85,90,20,94,F8,A9,00,B0,1050
1570 DATA D0,20,47,F6,A5,93,85,0A,1012
1580 DATA A9,00,85,93,A5,C3,48,A5,1046
1590 DATA C4,48,20,54,F8,A9,F0,20,1073
1600 DATA 81,02*,68,85,C4,68,85,C3,996
1610 DATA B0,36,24,9D,10,15,A0,63,719
1620 DATA 20,E6,F1,A0,05,B1,B2,AA,1193
1630 DATA F0,09,C8,B1,B2,20,D2,FF,1301
1640 DATA CA,D0,F7,A9,00,85,9E,A9,1286
1650 DATA 06,85,9F,A4,9E,C4,B7,B0,1175
1660 DATA 0E,B1,BB,A4,9F,D1,B2,D0,1296
1670 DATA BB,E6,9E,E6,9F,D0,EC,18,1432
1680 DATA A5,0A,85,93,A5,90,F0,03,1007
1690 DATA A9,18,38,90,01,60,20,6A,628
1700 DATA F6,A0,00,B1,B2,D0,04,A5,1138
1710 DATA B9,F0,0A,C8,B1,B2,85,C3,1318
1720 DATA C8,B1,B2,85,C4,A0,03,B1,1224
1730 DATA B2,38,A0,01,F1,B2,AA,A0,1144
1740 DATA 04,B1,B2,A0,02,F1,B2,A8,1108
1750 DATA 18,8A,65,C3,85,AE,98,65,1018
1760 DATA C4,85,AF,A5,C3,85,C1,A5,1355
1770 DATA C4,85,C2,A9,0F,20,81,02*,870
1780 DATA A5,90,F0,08,A9,1D,A6,93,1068
1790 DATA F0,02,A9,1C,A6,AE,A4,AF,1118
1800 DATA 60,85,AA,20,60,01*,A9,0C,709
1810 DATA 8D,16,91,A9,01,8D,15,91,785
1820 DATA A9,FF,8D,26,91,8D,25,91,1071
1830 DATA A9,FF,85,A9,20,59,01*,B0,1024
1840 DATA 10,20,43,03*,26,A9,A5,A9,659
1850 DATA C9,0F,D0,F0,20,33,03*,90,894
1860 DATA 03,4C,FB,02*,C9,0F,F0,F4,1032
1870 DATA A2,0E,E4,A9,D0,DA,20,33,1082
1880 DATA 03*,CA,10,F6,C5,AA,D0,D0,1250
1890 DATA A9,00,85,BD,A5,C1,85,C3,1177
1900 DATA A5,C2,85,C4,A5,C3,C5,AE,1419
1910 DATA D0,24,A5,C4,C5,AF,D0,1E,1215
1920 DATA 20,33,03*,C5,BD,18,F0,13,755
1930 DATA A9,20,05,90,85,90,A5,AA,962
1940 DATA C9,F0,D0,06,A9,10,05,90,989
1950 DATA 85,90,38,4C,1A,01*,20,33,519
1960 DATA 03*,B0,F8,A0,00,A6,93,D0,1108
1970 DATA 04,91,C3,F0,0C,D1,C3,F0,1240
1980 DATA 08,AA,A9,10,05,90,85,90,789
1990 DATA 8A,18,65,BD,85,BD,AD,0F,962
2000 DATA 90,29,FC,09,02,49,04,8D,666
2010 DATA 0F,90,E6,C3,D0,A6,E6,C4,1384
2020 DATA 4C,D4,02*,A0,08,20,43,03*,560
2030 DATA 26,A9,88,D0,F8,20,59,01*,921
2040 DATA A5,A9,60,A9,42,2C,2D,91,899
2050 DATA F0,FB,AD,1D,91,0A,0A,A9,1027
2060 DATA 01,8D,15,91,A9,FF,8D,25,910
2070 DATA 91,AD,21,91,60,END,109201,861
```

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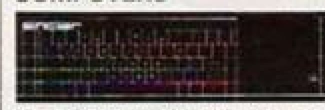
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AUTO line numbering
BREAK out of code loops
CLOCK digital clock
CURSOR CONTROL CODES allow strings to have complex shapes
DEF KEY user definable keys
DELETE a block of lines
DO-LOOP structure
DPOKE double poke
EDIT specified line
ELSE (used with IF ... THEN)
EXIT leave DO LOOP

FILL enclosed area with specified ink or paper
GET wait for keypress
JOIN two program lines
KEYIN a string
KEYWORDS new keywords on/off
LIST/LLIST line TO line
USED (used with GOTO, GOSUB)
ON ERROR trap errors (with LINE, STAT and ERROR)
PLOT a string (may contain cursor control codes)
POKE a string
POP Basic's stack
PROC, DEF PROC, END PROC (for named procedures)

RENUM versatile renumber
ROLL all or part of screen in any direction by specified number of pixels, with or without attributes
SCROLL like ROLL, but without wrap-round
SORT arrays (very fast)
SPLIT program lines
TRACE program execution
UNTIL used with DO or LOOP
USING used with PRINT
WHILE used with DO or LOOP
XOS, YOS move PLOT origin
XRG, YRG change PLOT scale

FUNCTIONS

AND (bit by bit)
BIN$ decimal to binary
CHAR$ number to 2 characters
COSE fast cosine
DEC hexadecimal to decimal
DPEEK double PEEK
FILLED filled area

HEX$ decimal to hexadecimal
INSTRING string search
MEM free memory
MEMORY$ all of memory as a string
MOD modulus
NUMBER 2 characters to number
OR (bit by bit)

RNDM fast RND
SCRN$ recognises user graphics
SINE fast sine
STRING$ repeats strings
TIME$ current time
USING$ formats numbers
XOR (bit by bit)

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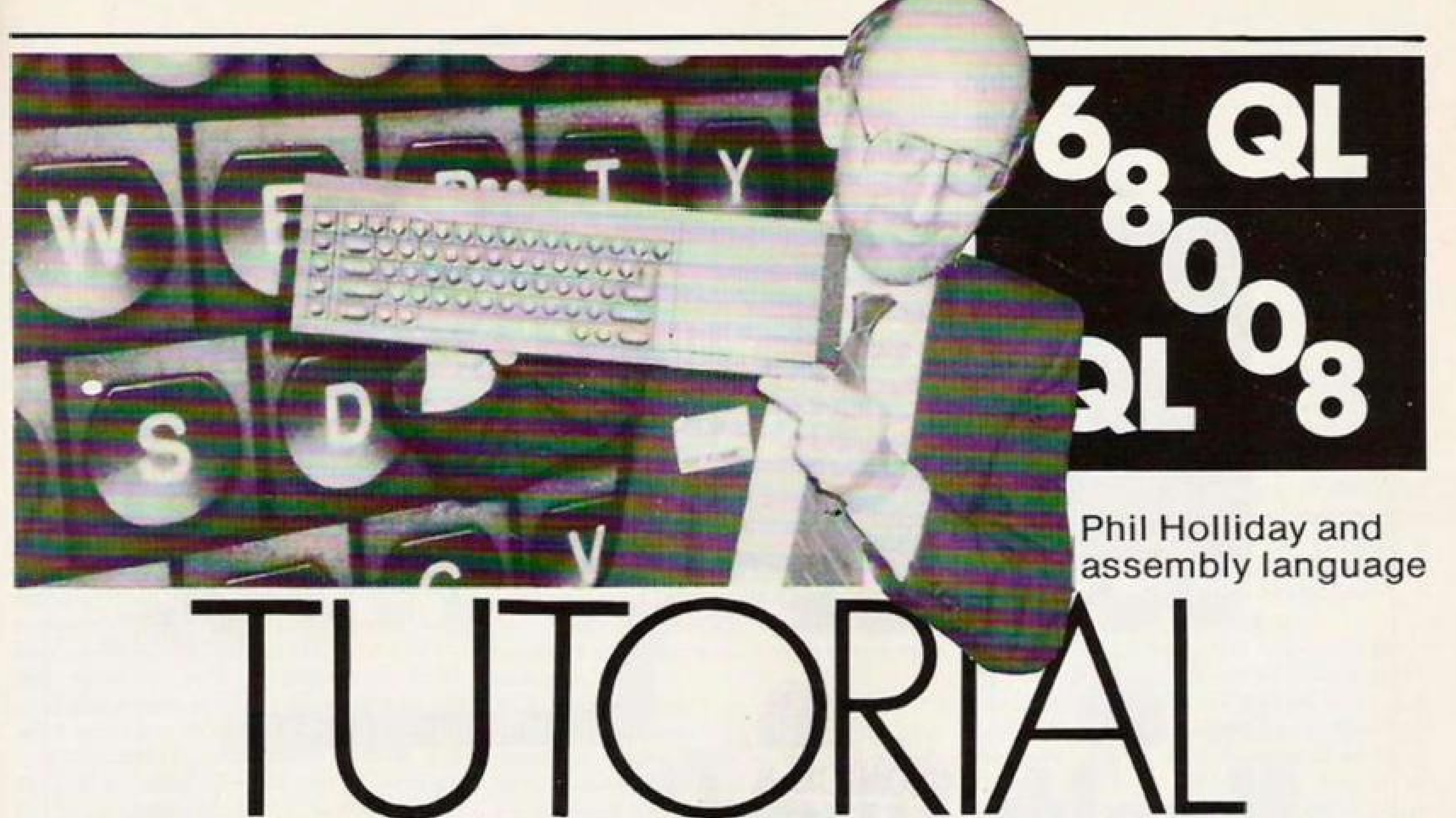
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Phil Holliday and assembly language

TUTORIAL

PROGRAMMING IN assembly language is the natural next step for those who are proficient in Basic and who feel a need to extend their skill for whatever reason, whether it is to increase speed of program execution or maybe to make better use of the available memory. Just as different micros have their own versions of Basic, so different microprocessors have their own assembly language.

The Sinclair QL is based on a Motorola 68008 microprocessor and this short series of articles is intended as an introduction to 68008 assembly language specifically on the QL. Those who already have some assembly language programming experience on another processor should find the conversion quite painless, while those who have no previous experience may find the going a little bit tough to start off with.

If this is the case then please stick with it — the benefits are well worth the effort, and this series includes several different examples of assembly language programs with assembled listings containing explanations of not only how the program works but also why a particular approach has been adopted in the first place.

Before getting down to the nitty gritty there are a few items worthy of mention. Firstly, the 68008 is a member of the 68000 family of microprocessors, which are all based on the same instruction set, and so the 68008 and the 68000 are 100 percent sofware compatible.

There are three essentials needed before attempting any serious assembly language programming on the QL. The first is a reference manual on the 68008 itself. The bible is *MC68000 16 Bit Microprocessor User's Manual — Motorola* published by Prentice-Hall. Another book which I have found very useful is *68000 Assembly Language Programming* by Kane, Hawkins and Leventhall published by Osborne/McGraw-Hill.

Secondly, we need a reference manual on QDOS, the QL operating system. We need this because the programs we write will use the resources of QDOS, partly to save us from writing routines which already exist within QDOS, and also so that we can use the much talked about multi-tasking abilities of the QL. Both the *QL Advanced User Guide* by Dickens, published by Adder, and *QL Assembly Language Programming* by Opie, published by McGraw-Hill are highly recommended as a reference manual on QDOS.

They both list all the QDOS system calls provided by QDOS and show how to interface our programs to the QL. System calls are primitive procedures which mean that we don't have to invent our own ways of doing these things. More of these topics later.

Finally, we need an assembler. Strictly speaking it is possible to hand assemble your programs, but this is a much more difficult task on a 16 bit processor than it is on 8 bit machine and is only recommended to the dyed-in-the-wool sadist. I have two assemblers which I can recommend: The QL Assembler Development Kit from Metacomco and the QL Assembler from Computer One.

Both are excellent products and include their own full screen editors. The Metacomco product has more features, most important of which are its support of macros, conditional assembly and include files, which are almost essential when writing large programs.

Before we are able to start to write in assembly language there are certain fundamental facts which must be presented and understood. These are:

- The 68008 programming model.
- The 68008 addressing modes.
- The 68008 instruction set.

These topics will be discussed in that order with the instruction set covered mainly in the next article.

The programming model is the way that the 68008 looks to the programmer and is illustrated in figure 1. It can be seen that the 68008 contains eight 32 bit — equal to four bytes, or two words or one long word — data registers, labelled D0 to D7. These data registers can be used to hold byte, word or long word values depending upon the instruction which operates on it.

If a byte or word operation on a data register takes place then only the low order byte or word contents of that register is affected. There are also eight 32 bit address registers, labelled A0 to A7.

Address registers do not support single byte operations. They are normally used as their name implies to hold addresses which point to memory locations — although they can also be used to hold data. Therefore, word operands are automatically sign extended to long words by the processor before being used. A0 to A6 are general purpose address registers. A7 is the system stack pointer, used to hold return addresses of subroutine branches — calls —

Figure 1. 68008 programming model.

```
33222222222211111111111
10987654321098765432109876543210
________________________________ D0
________________________________ D1
________________________________ D2
________________________________ D3
________________________________ D4
________________________________ D5
________________________________ D6
________________________________ D7

________________________________ A0
________________________________ A1
________________________________ A2
________________________________ A3
________________________________ A4
________________________________ A5
________________________________ A6

user stack pointer _____________ A7
supervisor stack pointer _______ A7

                 program counter
________________________________
           XNZVC status register
________________________________
```

(continued on page 157)

(continued from page 155)
for example.

In fact, there are two A7 stack pointers known as user stack and supervisor stack pointers which are selected depending upon the mode of operation of the processor. We will normally be in user-mode and this need not concern us any more for the moment. There is a 32 bit program counter, which contains the address of the next instruction to be executed.

It will be realised that not all of the 32 bits of the program counter and address registers S— when being used to hold an address — are used, since the 68008 can only address 1 megabyte of memory, and so only the lower 20 bits are actually relevant. Finally, the 68008 contains a 16 bit status register.

For low order five bits are of most interest to us. They contain condition code flags to indicate when there has been a carry (C), overflow (V), zero (Z) or negative (N) result from an operation. There is also an extend (X) flag which is used to implement multi-precision arithmetic. It is always set by the same operations that sets the carry flag.

Instructions for the 68008 contain two kinds of information — the type of operation to be performed and the location of the operand or operands on which that instruction operates. Most instructions specify the location using what Motorola refer to as an effective address and the different effective address modes will now be explained, with examples using the Move instruction. The Move instruction is used to move the contents of the source effective address to the destination address and the syntax of the instruction is . . .

MOVE source, destination

Before we start you must be aware that not all effective address modes can be used with all instructions — the manuals mentioned above give these details for each instruction individually.

■ Data register direct mode. The operand is in the data register specified in the instruction, so

MOVE.L D0,D1

will copy the contents of data register D0 into D1. Note that the ".L" appended to the Move instruction indicates that the "long word" contents, i.e. all 32 bits, will be moved. To move just the lower byte we would write Move.B and to move the lower word we would write Move.W or just Move as the default size for unspecified length is always word.

■ Address register direct mode. The operand is in the address register specified in the instruction. Note that there is a special version of the Move instruction — MoveA — Move address — which is used in this case, so

MOVEA.L D0,A0

will copy the contents of data register D0 into address register A0.

■ Address register indirect mode. The address of the operand is in the address register, and this mode is indicated by placing the address register in parenthesis, so that

MOVE.W D0,(A0)

will copy the lower 16 bits of D0 to the address held in A0, so that if D0 holds 1 and A0 holds $20000 (20000 hex) then the effect of this instruction is to copy 1 to memory location $20000.

■ Address register indirect with post-increment mode. This is similar to the previous — register indirect — mode, but with the added feature that after the move has taken place the contents of the address register is incremented. Note that the increment is by 1 if the move was of size byte, 2 for size word and 4 for size long.

This mode is indicated by placing the address register in parenthesis and followed by a plus sign. So if D0 contains 1 and A0 contains $20000 then

MOVE.W D0, (A0) +

will copy 1 to address $20000 and after the instruction A0 will contain $20002. When the address register is A7 this mode is equivalent to a stack Push instruction. Also note that when the address register is A7 and the size of the move is byte that the contents of A7 will be incremented by 2 instead of by to ensure that it always contains an even address, necessary as all instructions must start at even addresses.

■ Address Register Indirect with Predecrement mode. Very similar to the post-increment mode, except as you will already have guessed the address register specified is decremented according top the size of the instruction before copying the contents. This provides the equivalent of a stack Pop instruction if A7 is used, and the syntax is equally what would be expected, so

MOVE.W −(A0),D0

will have exactly the opposite effect of the previous example.

■ Address register indirect with displacement mode. In this mode the effective address is the sum of the contents of the specified address register and a fixed signed 16 bit displacement — i.e., the displacement can have a value of from −32768 to +32767.



The displacement is given before the parenthesis around the address register. This mode is extremely useful for accessing a particular element of an array or list. So if D0 contains 1 and A0 contains $20000 then

MOVE.B D0,$23(A0)

will copy 1 into the byte at address $20023.

■ Address register indirect with index mode. In this mode the effective address is the sum of the address in the address register specified, the word or long word contents of an index register which can be either a data or an address register and a signed 8 bit displacement — i.e., the displacement can have a range from −128 to +127. The syntax is of the form . . .

displacement (address reg,index reg.size)

and so if D1 contains $23,A0 contains $20000, A3 contains $10000 then the instruction

MOVE.W D1,$56(A0,A3.L)

will copy $23 to address $30056.

■ Absolute short address mode. In this mode the effective address specified is a signed word which is sign extended before it is used. So

(continued on page 159)

```
 LOC          OBJECT              SOURCE STATEMENT

                          !Listing 1

     =00020000            scr       equ $20000
     =0000                scr_size  equ $8000
     =1FFF                count     equ scr_size/4-1    loop count
     =FFFF                this_job  equ -1
     =0000                no_err    equ 0
     =0005                fr_job    equ 5               QDOS force
 job call

                          !firstly initialise pointer variables

0000'  41F9 0002 0000     start     lea scr,a0          a0 points to
  of screen                                               * start
0006'  303C 1FFF                    move.w #count,d0    initialise d0
 loop counter

                          !next write all zeros to screen memory

000A'  20FC 0000 0000     loop      move.l #0,(a0)+     clear 4 bytes
 incr pointer
0010'  51C8 FFF8                    dbf d0,loop         decr d0 & if
 -1 loop

                          !now remove the job using QDOS manager
                                                                trap
0014'  72FF                         moveq #this_job,d1
0016'  7600                         moveq #no_err,d3
0018'  7005                         moveq #fr_job,d0
001A'  4E41                         trap #1

                          !lastly return with d0 cleared

001C'  7000                         moveq #no_err,d0
001E'  4E75                         rts

                                    end

No errors found in this Assembly
```

(continued from page 157)

addresses can be specified in this mode in the range 0 to $7FFF — which is all in the QL Rom — and $F8000 to $FFFFF. So the instruction

MOVE.L $7000,D4

will copy the long word starting at address $7000 into data register D4.

■ Absolute long address mode. In this mode the effective address is a long word. It is not necessary to sign extend it as is the case for absolute short address mode of course, but it operates in the same way in other respects. So the instruction

MOVE.W D4,$20000

will copy the word in data register D4 to address $20000.

■ Program counter with displacement mode. This is a most important effective addressing mode as it allows us to write position independent programs, i.e., programs that can run anywhere in memory, as opposed to having to be loaded at a specific address.

In this mode the effective address is the sum of the contents of the program counter, which of course points to the instruction about to be executed, and a signed 16 bit displacement. The assembler format is basically the same as the address register indirect with displacement mode but in this case the program counter is used instead of an address register, so the instruction

MOVE.W $8(PC),D0

will move the word 8 bytes past the instruction into D0.

will move the word 8 bytes past the instruction into D0.

■ Program counter with index mode. This is again almost identical to the address register indirect with index, using the program counter instead of the address register. Comments made to the previous mode about positon independent code apply equally to this mode, so the instruction

MOVE.L $26(PC,A4.L),D0

will copy the contents of the address formed from the sum of the program counter plus the long word contents of A4 plus the displacement of $26 to data register D0.

■ Immediate data mode. In this effective address mode the operand specifies immediate data rather than the address of that data. The immediate data is indicated by a hash (#) symbol preceeding it. So the instruction

MOVE.B #$44,D0

will move the value $44 into the low order byte of D0.

The main instruction set of the 68008 is tabulated in table 1.I have listed the mneumonic and a brief description of the operation. I have not included all the variants of the different instructions. Of course you need to know a lot more about the various instructions before you can use them, but it does give the general flavour of the 680008.

I do not intend to discuss every instruction in detail, but rather to expand on those which are more frequently used and to use them in various examples of routines which can be tried on the QL. This will form the subject of the next article in this series, but before starting on that it is a useful exercise to show how we can use these routines from Basic.

To illustrate this listing 1 is a simple routine

68008 QL QL

to clear the whole of the screen by writing all zeros to the screen memory which resides from address $20000 to $27FFF inclusive.

The program will be a loop which is initialised with a0 pointing to the bottom of screen memory, and d0 holding the number of times we go round the loop. within the loop we will clear some memory, increment a0 to point to the next memory location, and decrement d0 and test it to see if we have reached the top of the screen memory.

Obviously we will use the Move instruction which has already been described in the section on addressing modes. The LEA — load effective address — instruction is used to initialise a0.

The looping instruction we will use is DBcc where cc is one of the 16 condition codes included in the instruction set table.

This instruction decrements the specified data register and also tests to see if a condition specified is met. In this program we have set the condition to false so that this test will always fail.

If the condition was met then the next instruction would be executed, i.e., it would exit the loop. If the condition is not met and the specified data register has reached a value of −1 then the loop will be exited. In the example this occurs when the whole of screen memory has been cleared.

Having cleared the screen we need to return back to Basic. If this program is invoked by an Exec command then it will be created as a job under QDOS and so it is necessary to remove this job. A system call is used — see the QDOS manuals — which requires small values being placed in data registers, and to do this we use a special version of the move instruction, MoveQ — most quick — which sign extends a number lying between −128 and +127 to a 32 bit number.

The trap instruction is a call to an address locted in a table of address pointers which are set up in the QL Rom and actually causes the job to be removed. Finally we return using the RTS instruction, having first of all cleared data register 0 in case the program is invoked with a Call.

If you have an assembler you can of course enter the program and automatically generate an executable file. Alternatively, you can enter the assembled code which is shown in hex in the listing after the address field using a hex loader, and either place it in the resident procedure area using RESPR, and then Call it, or save it using Sexec as described in the QDOS entry of the concepts section in the QL User Guide. ■

Table 1. 68008 instruction set.

Mnemonic	Description
ABCD	add decimal byte with extend bit
ADD	add
AND	logical and
ASL	arithmetic shift left
ASR	arithmetic shift right
Bcc	branch conditional
BCHG	bit test and clear
BCLR	bit test and clear
BRA	branch always
BSET	bit test and set
BSR	branch to subroutine
BTST	bit test
CHK	check register against bounds
CLR	clear operand
CMP	compare
DBcc	test condition, decrement and branch
DIVS	signed divide
DIVU	unsigned divide
EOR	exclusive or
EXG	exchange registers
EXT	sign extend
JMP	jump
JSR	jump to subroutine
LEA	load effective address
LINK	link stack
LSL	logical shift left
LSR	logical shift right
MOVE	move
MOVEM	move multiple registers
MOVEP	move peripheral data
MULS	signed multiply
MULU	unsigned multiply
NBCD	negate decimal with extend
NEG	negate — 2's complement
NOP	no operation
NOT	1's complement
OR	logical or
PEA	push effective address
RESET	reset external devices
ROL	rotate left without extend
ROR	rotate right without extend
ROXL	rotate left with extend
ROXR	rotate right with extend
RTE	return from exception
RTR	return and restore
RTS	return from subroutine
SBCD	subtract decimal with extend
Scc	set conditional
STOP	stop
SUB	subtract
SWAP	swap data register halves
TAS	test and set operand
TRAP	trap
TRAPV	trap on overflow
TST	test
UNLNK	unlink
Condition codes — cc in above table.	
CC	carry clear
CS	carry set
EQ	equal
F	false
GE	greater than or equal
GT	greater than
HI	high
LE	less than or equal
LS	low or same
LT	less than
MI	minus
NE	not equal
PL	plus
T	true
VC	no overflow
VS	overflow



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Do you have a problem? Your manual is incomprehensible or you just cannot get the hang of that programming trick you tried — whatever it is, Tim Hartnell will do his best to answer your queries. Please include only one question per letter and mark them "Response Frame".

MONITOR OR TV?

I own a Spectrum 48K micro and am wanting to purchase a colour monitor. I have seen a feature in a recent magazine which shows how simple the modification is to provide a composite video signal and it is this which has prompted me to consider a monitor rather than a TV. What is confusing me is that I have seen advertisements for a colour monitor designed to accept signals from the Spectrum "direct" — the Microvitec — and I assume "direct" to mean unmodified. Is this a true monitor, or am I misinterpreting the meaning of "direct". I note also there are colour monitor/colour TV composite models available. I would greatly appreciate some guidance on selecting the most suitable type for my computer.
Derek Cale,
Grimsby,
South Humberside.

ACCORDING TO a Mr Hardy at Microvitec, the monitor you've seen advertised — model number 1431/MZ3 — is a true monitor, that includes all the modifications within the monitor itself. This monitor is driven from the Spectrum edge connector, not from the TV output port. If you connected any standard monitor to the "TV" socket, you would not get a picture.

The Microvitec monitor allows other peripherals to be connected to the Spectrum by duplicating the edge connector. This monitor is "standard resolution" — that is, 452 horizontal pixels — and will therefore work as well with any RGB computer, such as the BBC Micro.

AMSTRAD SYMBOL

I have been having trouble with defining some characters on the Amstrad using the Symbol command. I've followed the instructions in the manual, but it just doesn't seem to work. When I print the characters which I thought I had defined, they just come out the same as they were when I turned the computer on. What am I doing wrong?
William Dodd,
Southampton.

ACCORDING TO Clive Gifford, author of *50 Dynamic Games for the Amstrad,* the problem may well be occurring because the manual does not fully explain the use of the Symbol After command. Before you start using Symbol, you need to use Symbol After, which makes it possible to use Symbol with a group of character numbers. That is, if you wanted to redefine one or more characters whose numbers were greater than 127, you'd need to include the line Symbol After 127 in your program. This would then allow you to redefine characters 128, 129 and so on.

AUTOMATIC RUN

Many of my friends have programs on their Spectrums which run automatically when they load them. I would like to be able to do this on my Amstrad. I have read through the manual several times, but it does not seem to include this information. What can I do to solve my problem?
Terry Stickles,
Birmingham.

IT APPEARS that you have not been looking carefully enough in the manual. Save the program as normal. Then, when loading it back, type in Run "nameofprogram" instead of Load "nameofprogram". This will load and auto-Run your program.

COMPILER QUERY

If I understand it correctly, the purpose of a compiler is to convert Basic to machine code. I have a Vic-20 and plan to buy a Super-Extender Cartridge. Will a normal compiler be able to function on the Vic-20 with the Expander operating?
Pramod K Joshi,
West Bridgford,
Nottinghamshire.

COMPILERS HAVE been developed for the Vic-20, but the are only designed to cater for the commands supplied as standard in Vic-20 Basic. There is no way an ordinary Vic-20 compiler could cope with the additional commands — such as extra graphics words — in an Expander's vocabulary. So the answer, Pramod, is — I'm afraid — no.

LANGUAGES

Most microcomputers are programmable in some sort of Basic. For many of them, it is possible to buy other languages, such as Forth and Pascal. I know that both of these run much more quickly than Basic because they are compiled rather than interpreted. I have been told that each language has its own particular field in which it is most powerful. Can you tell me something about the applications of Pascal and Forth, and possibly about some other interesting languages?
S Klaassens,
Nijkerk,
Holland.

SPECIFIC LANGUAGES are usually created for specific needs. A general purpose language like Basic, which was created mainly to be easy to learn, is usually all right at many things, but not very good at any of them. Forth, which was created by Charles Moore originally to control a radio telescope, is a fairly primitive language in its supplied form, with a very limited vocabulary.

However, its immense strength is that it allows you to create new words of your own, and use them from then on as though they were part of the language, even to the extent of using your own words in the creation of others. For example, if you invented the word Dash to draw 20 hyphens on the screen, you could invent a word called, say, Lottadashes to equal Dash being executed 20 times. Dash and Lottadashes could stay in your Forth vocabulary for ever. Basic has no such capability.

Pascal was developed by N Wirth with the intention of creating a language which would enforce disciplined programming techniques.

Pascal programs can, in some cases, read almost like a statement of the problem in English. They are usually "transparent" to people other than the programmer — which is rarely true of Forth programs, and only true of well-structured Basic programs — and are consequently easy to maintain and modify. It is interesting to note that QL SuperBasic — and to a lesser extent BBC Basic — incorporate some of the better features of Forth and Pascal.

Other languages, such as Logo and Lisp, have found applications in specific fields. Experience with any language in additon to Basic will help you to become a better programmer, as you'll start thinking more in terms of what you want the program to achieve rather than in terms of what lines of program will do this.

Most languages have strong, if not fanatical, adherents. Forth programmers, in particular, defend Forth most ardently. I was being interviewed on Capital Radio once with a Forth programmer who nearly punched me in the face when I tried to make a case for Basic being a good language to start programming with, because it was so easy to get positive feedback from the computer.

COLOUR OR NOT?

I would be most grateful if you could explain the problem which I am experiencing with my ZX Spectrum 48L. When connected to my Philips TV it functions normally and responds to all the colour instructions, but when connected to an Hitachi 12in. portable it will only produce black and white signals. I have, of course, adjusted the necessary pre-set tuner controls without any improvement. I have seen in a previous reader's query a similar problem which necessitated the reader making an adjustment within the Spectrum.
R L Turner,
Redditch.

EARLY SPECTRUMS, in particular, were a little choosy regarding the colour TV's they would work well with. A spokesman for Sinclair Research said there was no evidence that any particular model or make refused to generate colour signals when fed by a Spectrum. The easiest answer I can give you is to wait until the warranty period is over, open the Spectrum, and turn the little screws on one of the flat potentiometers you can see, which controls colour intensity. Apart from that, I'd stick to the Philips.

In a recent issue of Your Computer *a reader asked about including Verify within a Spectrum program. A number of people wrote to me regarding their experiences with this. Ian Philpot from Tonbridge, Kent writes:*

I have been using the Verify command in a program in exactly the way your correspondent describes. What may be the significant difference is that I have been saving data in a character array (in fact, the league tables of my local badminton league) and then verifying the saved array. This seems to work perfectly. However, I had not, until I read your comments, tried to Save and Verify the main program in this way. I then tried the following program:

```
5 FOR n = 1 TO 96
10 PRINT "a"
20 NEXT n
22 SAVE "test" LINE 1
25 PRINT "Rewind and press
   any key"
30 PAUSE 0
35 VERIFY "test"
```

This worked perfectly every time. It seems to work just as well with further lines added. It appears therefore that any problem would lie with the saving routine, rather than in the use of the Verify command in the program.

M R Trevarthen of Alexandria, Dunbartonshire, points out in reference to the same query, that you should not include user-friendly inputs like "Do you wish to Verify" ;Z$ between the Save and Verify lines in the program, as this adds to or changes part of the program already saved. This Verify will fail. Using Inkey$ does the same thing.



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Moon Rescue

T Loton,
Stoke-on-Trent,
Staffordshire.



YOU ARE the commander of the Intergalactic Rescue Service. You are informed that four scientists are stranded on the moon's surface and it is your job to rescue them. As you hover above the moon's surface in your spaceship you see below you a dangerous asteroid belt which separates you from the stranded scientists.

When you think the time is right you must launch your rescue pod and guide it through the asteroid belt to pick up one of the scientists. Watch out when returning to your spaceship because the asteroid belt has now been replaced by a fleet of enemy flying saucers. You get 10 points added to your score every time you rescue a scientist successfully.

If, however, you hit an asteroid, a flying saucer or the moon's surface or fail to re-dock with your spaceship you lose a life. You start each game with three lives, 25 fuel units, and four scientists to rescue. At the start of each game a tune is played.

Keys to use are: Z = left; X = right; \ = launch pod/thrust.

No loading instructions are needed, just type in the program and save it normally.

```
5 MODE 0:PRINT "RESCUE"
10 ENV 1,7,2,1:ENV 2,15,-1,8:ENV 3,7,-2,1,7,2,1,7,-2,1
,7,2,1
20 READ NO,DU:IF NO=-1 THEN 50
30 SOUND 1,NO,-DU,15,3
40 GOTO 20
41 DATA 159,3,213,1,190,3,213,1,119,1,127,1,142,1,159,
1,142,3,213,1,119,1,127,1,142,1,159,1,142,2,213,2,106,
8
42 DATA 95,2,106,1,159,1,106,2,119,2,127,2,190,1,159,1
,127,2,142,2
43 DATA 127,4,119,1,127,1,142,1,159,1,142,4,127,1,142,
1,159,1,169,1,159,8
49 DATA -1,-1
50 SYMBOL AFTER 97
60 FOR i=20000 TO 20048:READ a:POKE i,a:NEXT
70 FOR i=20500 TO 20526:READ a:POKE i,a:NEXT
80 FOR i=20550 TO 20576:READ a:POKE i,a:NEXT
90 DATA &dd,&21,&30,&75,&06,&05,&dd,&7e,&00,&3d,&fe,&f
f,&c2,&31,&4e,&3e,&14,&dd,&77,&00,&dd,&23,&10,&ee
100 DATA &dd,&21,&35,&75,&06,&05,&dd,&7e,&00,&3c,&fe,&
15,&c2,&49,&4e,&3e,&00,&dd,&77,&00,&dd,&23,&10,&ee,&c9
110 DATA &06,&05,&dd,&21,&30,&75,&0e,&05,&dd,&66,&00,&
69,&cd,&75,&bb,&3e,254,&cd,&5a,&bb,&dd,&23,&0c,&0c,&10
,&ee,&c9
120 DATA &DD,&21,&35,&75,&0E,&06,&06,&05,&DD,&66,&00,&
69,&CD,&75,&BB,&3E,&FF,&CD,&5A,&BB,&DD,&23,&0C,&0C,&10
,&EE,&C9
130 FUEL=25:SCORE=0:LI=3:MEN=4
140 MODE 0:FUEL=25:INK 0,0:INK 2,2:INK 3,9:INK 4,15:BO
RDER 0:INK 1,26:INK 5,24:INK 6,8,26:FOR i=30000 TO 300
09:POKE i,INT(RND*20):NEXT:WINDOW #1,1,20,4,14
150 SPEED INK 5,5
160 SYMBOL 254,56,126,127,255,255,255,124,56:SYMBOL 25
5,120,252,252,254,254,63,63,31
170 SYMBOL 97,0,0,7,15,31,63,127,255:SYMBOL 98,0,0,255
,165,165,255,255,129:SYMBOL 99,0,0,&X11100000,240,248,
252,254,255:SYMBOL 100,255,243,243,255,255,127,63,31:S
YMBOL 101,255,&X11001111,&X11001111,255,255,254,252,24
8
180 SYMBOL 102,192,240,240,248,248,248,254,255:SYMBOL
103,1,15,31,31,31,127,255,255:SYMBOL 104,255,255,255,2
55,255,255,255,255
190 SYMBOL 240,24,36,66,66,36,60,90,195
200 PEN 3:LOCATE 1,15:PRINT"f                    ghf
         ghhhf                ghhhhhf               ghhh
hhhhf            ghhhhhhhhhhf            ghhhhhh";
210 PRINT "hhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh"
220 PEN 4:LOCATE 7,20:PRINT CHR$(250);" ";:IF MEN>1 TH
EN PRINT CHR$(248);" ";:IF MEN>2 THEN PRINT CHR$(248)
;" ";:IF MEN>3 THEN PRINT CHR$(251)
230 A=1:D=1
240 REM
250 IF D=1 AND A<16 THEN A=A+1 ELSE D=0
260 IF D=0 AND A>1 THEN A=A-1 ELSE D=1
270 PEN 2:LOCATE A,1:PRINT " abc ":LOCATE a,2:PRINT "
d e "
280 PEN 1:CALL 20000:CLS #1:CALL 20500:CALL 20550
290 IF INKEY(22)=0 THEN SOUND 1,120,12,0,1:GOTO 310
300 GOTO 250
310 X%=A*32+32:Y%=400-33
320 REM ************ MAIN LOOP **********
330 CALL 20000:CLS #1:PEN 1:CALL 20500:CALL 20550
340 IF INKEY(71)=0 AND THRUST=0 AND X%>0 THEN GOSUB 45
0:X%=X%-32
350 IF INKEY(63)=0 AND THRUST=0 AND X%<607 THEN GOSUB
450:X%=X%+32
360 IF INKEY(22)=0 AND FUEL>0 THEN SOUND 1,0,25,7,0,0,
2:FUEL=FUEL-5:THRUST=1 ELSE THRUST=0
370 IF THRUST=0 THEN GOSUB 450:Y%=Y%-16
380 CH=TEST (X%+15,Y%-7)
390 IF CH=3 THEN 460
400 PLOT X%,Y%,5:TAG:PRINT CHR$(240);:TAGOFF
410 IF CH=1 THEN 460
420 IF CH=4 THEN 540
430 LOCATE 1,23:PEN 7:PRINT "FUEL:";FUEL
440 GOTO 330
450 MOVE X%,Y%:TAG:PRINT " ";:TAGOFF:RETURN
460 PLOT X%,Y%,6:TAG:PRINT CHR$(238);:TAGOFF
470 SOUND 1,0,0,15,2,0,7
480 LOCATE 1,24:PEN 8: LI=LI-1:PRINT"LIVES:";LI:FOR I=
1 TO 500:NEXT
490 IF LI=0 THEN 500:ELSE  140
500 LOCATE 6,10:PEN 1:PRINT "GAME OVER"
510 LOCATE 6,11:PRINT "SCORE:";SCORE
520 LOCATE 6,13:PRINT "HIT SPACE"
530 IF INKEY(47)<>0 THEN 530 ELSE RUN
540 INK 1,6:SYMBOL 254,0,60,126,165,165,126,60,0:SYMBO
L 255,0,60,126,165,165,126,60,0
550 REM ********** UP **********
560 PEN 1:CALL 20000:CLS #1:CALL 20500:CALL 20550
570 GOSUB 450
580 IF INKEY(71)=0 AND X%>0 THEN X%=X%-32
590 IF INKEY(63)=0 AND X%<607 THEN X%=X%+32
600 Y%=Y%+16
610 CH=TEST (X%+15,Y%-2)
620 PLOT X%,Y%,5:TAG:PRINT CHR$(240);:TAGOFF
630 IF CH=1 THEN 460
640 IF Y%>368 THEN IF X%<>A*32+32 THEN 460 ELSE 660
650 GOTO 560
660 SOUND 1,60,25,15:MEN=MEN-1:SCORE=SCORE+10:IF MEN=0
 THEN 670 ELSE 140
670 MEN=4:GOTO 140
```

Sheepdog

Neil Ghani,
Gosforth,
Newcastle-upon-Tyne.



YOU CONTROL a sheepdog and the objective is to muster a small flock of six dirty yellow sheep through a sheep dip and then the clean white sheep must be chased through the gate into the next field. For every unclean sheep you have 25 seconds added onto your time.

There are also bushes dotted about around the right-hand side of the field and the sheep may stop to graze at these. Keys 5, 6, 7, and 8 control the sheepdog.

```
  10 INK 0: PAPER 5: BORDER 1: C
LS : GO SUB 7000
1000 FOR f=1 TO 11 STEP 2: IF (a
(f)=6 OR a(f)=7) AND a(f+1)>5 AN
D a(f+1)<12 THEN LET sx=1: LET a
d=1: LET sy=0: LET a$(f)="7": LE
T a$(f+1)="0": FOR g=1 TO 5: BEE
P .01,10-RND*9: NEXT g: GO TO 10
60
1010 LET sy=SGN (a(f)-y) AND ABS
 (a(f+1)-x)<4 AND ABS (a(f)-y)<4
1020 LET sx=SGN (a(f+1)-x) AND A
BS (a(f)-y)<4 AND ABS (a(f+1)-x)
<4
1030 LET sx=sx+INT (RND*3)/2-.5:
 LET sy=sy+INT (RND*3)/2-.5: IF
(a(f)=6 OR a(f)=7) AND a(f+1)<14
 AND a(f+1)>10 THEN LET sx=ABS s
x
1040 LET sx=sx+(a(f+1)<1)*2-(a(f
+1)>29)*2-(a(f+1)>22 AND a(f+1)<
27 AND (a(f)<9 OR a(f)>12))+(a(f
+1)>25 AND a(f+1)<27)*2
1050 LET sy=sy+(a(f)<2)*2-(a(f)>
19)*2+(a(f+1)>5 AND a(f+1)<9 AND
 a(f)=9)
1060 IF ATTR (a(f)+sy,a(f+1)+sx)
=96 THEN LET sx=0: LET sy=0
1070 LET a(f)=a(f)+sy: LET a(f+1
)=a(f+1)+sx: PRINT AT a(f)-sy,a(
f+1)-sx;" "
1080 PRINT INK VAL a$(f);AT a(f)
,a(f+1);CHR$ 146: IF ad THEN GO
SUB 8520: LET ad=0
1090 IF a(2)>25 AND a(4)>25 AND
a(6)>25 AND a(8)>25 AND a(10)>25
 AND a(12)>25 THEN GO TO 4000
1500 PRINT AT y-y1,x-x1;" "; INK
 0;AT y,x;CHR$ (144+di)
2000 LET x1=(INKEY$="8")-(INKEY$
="5")+(x<1)-(x>23): LET y1=(INKE
Y$="6")-(INKEY$="7")+(y<1)-(y>20
): LET di=(INKEY$="5")
2010 IF ATTR (y+y1,x+x1)=96 THEN
 LET x1=0: LET y1=0
2020 LET x=x+x1: LET y=y+y1
2030 NEXT f: LET go=go+1
```

(continued on page 165)

(continued from page 163)

```
2500 PRINT INK 0;AT 0,27;INT (go
+3)
2510 IF go/10=INT (go/10) THEN G
O SUB 8510
2520 GO TO 1e3
4000 INK 0: PRINT AT 10,2;"You h
ave penned all";AT 11,2;"the she
ep."
4010 LET sc=FN c(): PRINT AT 13,
2;"You took ";sc;" Seconds."
4020 INK 0: FOR f=-25 TO 25: BEE
P .1,f: BEEP .1,25-f: NEXT f
4030 LET sd=0: FOR f=1 TO 6: LET
 sd=sd+VAL a$(f-2): NEXT f
4040 PRINT AT 15,2;6-sd;" Sheep
were cleaned"
4050 PRINT AT 17,3;"Penalty = ";
sd*25
4060 LET sc=sc+25*sd
4100 IF hs>sc THEN LET hs=sc: PR
INT AT 18,1;"Well done - a new r
ecord!"
4110 PRINT AT 19,1;"Top score =
";hs
4120 PRINT AT 21,3;"Another game
? (y/n)"
4130 IF INKEY$="y" THEN GO TO 42
00
4140 IF INKEY$="n" THEN PAPER 7:
 BORDER 7: CLS : STOP
4150 GO TO 4130
4200 GO SUB 8100: GO TO 1000
8000 FOR f=32600 TO 32631: READ
a: POKE f,a: NEXT f
8010 LET hs=500
8100 DIM a(12): DIM a$(12): FOR
f=1 TO 11 STEP 2: LET a(f)=8+f:
LET a(f+1)=5
8110 LET a$(f)="6": LET a$(f+1)=
"1": NEXT f
8120 LET x=1: LET y=1: LET di=0
8130 LET x1=0: LET y1=0: LET go=
0
8140 LET ad=0
8200 DEF FN a(m,n)=(m+n+ABS (m-n
))/2: DEF FN b()=(PEEK 23672+256
*PEEK 23673+65536*PEEK 23674)/50
: DEF FN c()=FN a(FN b(),FN b())
8210 POKE 23672,0: POKE 23673,0:
 POKE 23674,0
8500 PAPER 4: BORDER 6: CLS : FO
R f=1 TO 10: LET rs=INT (RND*20)
: LET pr=15+INT (RND*8): PRINT I
NK 0; BRIGHT 1;AT rs,pr;CHR$ 147
: NEXT f
8510 INK 2: FOR f=1 TO 4: PLOT 2
00+f*2+(f>2)*2,0: DRAW 0,72: DRA
W INK 4;0,32: DRAW 0,71: NEXT f
8520 PRINT PAPER 5; INK 1;AT 5,8
;"###";AT 6,8;"   ";AT 7,8;"   "
;AT 8,8;"###": RETURN
9000 DATA 0,2,134,125,124,194,12
9,0,0,64,97,190,62,67,129,0
9010 DATA 0,7,255,252,252,68,68,
0
9020 DATA 0,16,84,56,146,84,56,1
6
```

Sprinter

Nicholas Giacoumatos, Shoreham by Sea, West Sussex.



THE OBJECT of the game is to run as fast as you can in two races. The first is the qualifying race, the second is the final. Your power increases and so does your speed when you hit the key. You can win gold, silver bronze or nothing but watch out — the more power the more energy is used. At the end of the first ra.e you are awarded bonus energy to see you though the final, but if you run too fast you will collapse of exhaustion.

Type in the first part of the program and save it. Do the same with part two — be careful with the data — and save it after part 1 on the same tape. After part 2 type in and save part 3. You should then have a copy of Sprinter. To load hold down Shift and hit Run/Stop, and press play on the tape deck. The program should load automatically. At the start of the game you will see a track, a crowd and a 10 second countdown in the top left corner to give you time to build up a start, good luck. 3K expansion is needed.

Parts 1 and 2 of the program have an auto load system at the end of them. When you type them in save them first. Do not run them until they are saved. If an error occurs note it down and load the part in again. Type the correction in and save the program once again. Do this until the two parts of the program are perfect.

Part 1.

```
1 PRINT"J"
2 GOSUB100:GOSUB110:GOSUB10
3 GOSUB100:PRINT"J"
4 POKE631,76:POKE632,111:POKE633,13:POKE634,82:POKE635,85:POKE636,78:POKE637,13
5 POKE198,7:NEW
10 POKE36878,15
11 READN,D
12 IFN=-1THENPOKE36875,0:RETURN
13 POKE36875,N:FORT=1TOD:NEXT
14 GOTO11
20 DATA215,300,223,250,228,250,231,250,228,350,223,450
21 DATA215,250,223,250,228,250,231,250,228,550
22 DATA215,250,223,250,228,250,231,250,228,250,223,450
24 DATA223,100,223,100,223,100,223,100,215,600,-1,-1
99 RETURN
100 PRINT"J     H.G PRESENTS     ";
101 PRINT""
102 PRINT"                    "
103 PRINT"     "
104 PRINT"    "
105 PRINT"     O M P U T H O N"
106 PRINT"  "
107 PRINT"               "
108 PRINT"                "
109 PRINT"                "
110 PRINT"                "
111 PRINT"                "
112 PRINT"                "
113 PRINT"                "
114 PRINT"                "
115 PRINT""
116 PRINT"      M E T R E S"
117 FORT=1TO5000:NEXTT:RETURN
118 PRINT"J"
119 PRINT""
120 PRINT"                  "
121 PRINT"                  "
122 PRINT"                  "
123 PRINT"                  "
124 PRINT"                  "
125 PRINT"                  "
126 PRINT"                  "
127 PRINT"                  "
128 PRINT"        E V E N T"
199 RETURN
```

Part 2.

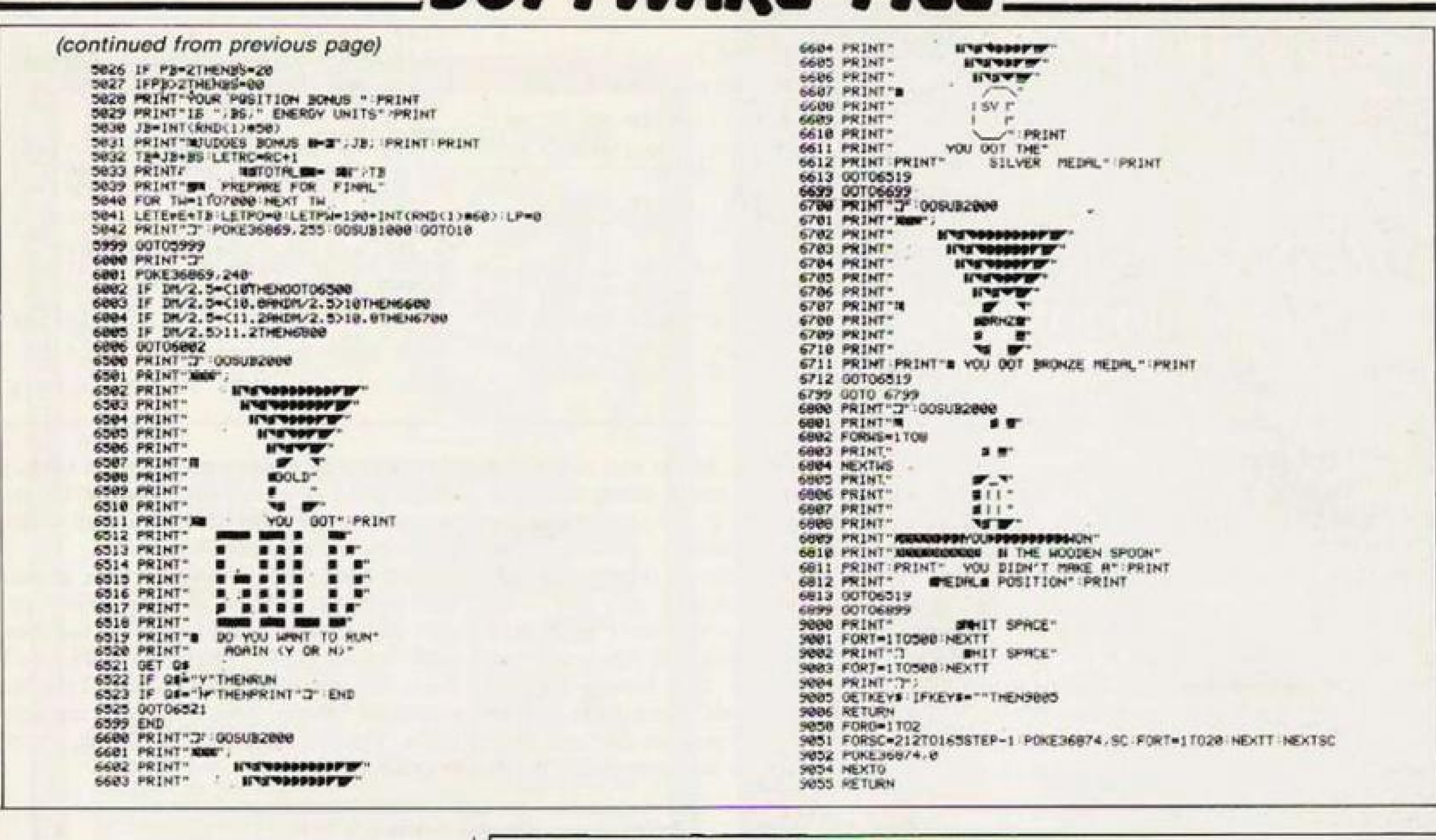
```
1 PRINT"J":FORA=7168TO7679:POKEA,0:NEXTA
2 N=7900
5 FORA=7168TO7679:READB:IFB>255THENPRINT"DATA ERROR":END
6 IFB<>-1THENPOKEA,B:LETW=W+B:NEXTA
7 IFW<14070THENPRINT"INCORRECT DATA":PRINT"ERROR":END
8 IFW>14070THENPRINT"INCORRECT DATA":PRINT"ERROR":END
9 GOSUB100
10 DATA0,195,129,141,138,157,221,235,20,195,171,170,205,235,227,235
11 DATA20,227,107,43,93,253,253,254,20,226,225,211,235,227,235,227
12 DATA20,247,247,247,247,247,247,243
15 DATA0,0,0,0,0,0,0,0
16 DATA60,66,165,129,165,153,66,60
17 DATA255,255,255,255,255,255,255,255
18 DATA0,255,255,255,255,255,255,255
19 DATA170,85,170,170,170,170,170,170,255,170,170,170,170,170,255,255
99 DATA-1
100 FORFL=1TO8
101 PRINT"          NOW LOADING SPRINTER ";
102 FORT=1TO500:NEXTT
103 PRINT"          NOW LOADING SPRINTER "
104 FORT=1TO500:NEXTT
105 NEXTFL
106 PRINT"J":PRINT"        PLEASE WAIT"
107 PRINT"      DO NOT STOP TAPE"
108 PRINT""
110 POKE631,76:POKE632,111:POKE633,13:POKE634,82:POKE635,85:POKE636,78:POKE637,1
3
111 POKE198,7:NEW
```

Part 3.

```
0 E=300
1 PRINT"J":PB=0:RC=0
2 POKE36869,255
3 GOSUB1000:S=36877
4 PW=190+INT(RND(1)*60):PO=0:POKE36878,15:LP=0
5 POKES,0
10 S=36877:POKE36878,15:M=7988:MC=M+30720
15 FORCD=10TO1STEP-1:PRINT"      ";CD;"    ":GOSUB9999
16 NEXTCD:PRINT"      GO"
17 POKES,128:FORVF=15TO1STEP-1:FORJ=1TO10:NEXTJ:NEXTVF:POKES,0
18 PRINT"     "
19 TI$="000000":DM=VAL(TI$):POKES,0
20 POKEM,0:POKEM+22,3:POKEM+44,4:POKES,130:FORQ=1TO5:NEXTQ:POKES,0
25 POKEMC,2:POKEMC+22,2:POKEMC+44,2:FORT=1TOPW:NEXT
26 GETA$
29 IFA$="f"THENPO=PO+1:LETPW=PW-10:LETE=E-2
30 IFA$<>"f"THENLETE=E-1
31 LETM=M+1:LETMC=MC+1:POKEM,0:POKEM+22,1:POKEM+44,2
32 IFPW=<0THENLETPW=0
33 IFE=<0THENGOTO3000
34 GOSUB45:GOSUB500:FORT=1TOPW:NEXT
35 IFM=8009THENGOSUB46:LETM=7988:MC=M+30720:PRINT"J":GOSUB1000:LETLP=LP+1:GOTO37
36 GOTO20
37 IFLP=3THENPOKE36876,212:FORO=1TO50:NEXTO:POKE36876,0:PRINT"  FINISH"
38 IFLP=4ANDRC=1THEN6000
39 IFLP=4THEN2001
40 GOTO30
45 POKEMC,2:POKEMC+22,2:POKEMC+44,2
46 POKEM-1,0:POKEM+21,0:POKEM+43,0
47 POKEMC-1,2:POKEMC+22-1,2:POKEMC+44-1,2
48 RETURN
500 PRINT"                         POWER=";PO;"    ENERGY";E
501 DM=VAL(TI$)
502 PRINT"   0000000":PRINT"   EEEEEEG":PRINT"   0000000"
503 PRINT"                  "
504 PRINT"       DM/2.5;" "
599 RETURN
999 FORI=1TO500:NEXTI:RETURN
1000 PRINT"";
1001 FORCR=1TO8:PRINT"FFFFFFFFFFFFFFFFFFFFFFF";:NEXTCR
1002 PRINT"IIIIIIIIIIIIIIIIIIIIIII";
1003 PRINT"JJJJJJJJJJJJJJJJJJJJJJJ";:PRINT"0000000000000000000000";
1004 PRINT"                          ";:PRINT"0000000000000000000000";
1005 FORTR=1TO5:PRINT"HHHHHHHHHHHHHHHHHHHHHH";:NEXTTR
1007 PRINT"0000000000000000000000";
1008 FORGD=1TO3:PRINT"                          ";:NEXTGD
1009 FORGB=8164TO8185:POKEGB,230:POKEGB+30720,5:NEXTGB
1011 RETURN
2000 POKES,220:FORL=1TO500:NEXTL:FORV=13TO0STEP-1:POKE36878,V:FORY=1TO300:NEXTY,
V:RETURN
2001 GOSUB2000:PRINT"J":POKE36869,240
2002 PRINT"              YOU GOT A":PRINT
2003 PRINT"       TIME OF ":PRINT
2004 PRINT"       ";DM/2.5;"SECS.":PRINT
2005 IFDM/2.5=<11.2THEN FORU=1TO1000:NEXTU:GOTO5000
2006 IFDM/2.5>11.2THENPRINT"  YOU DIDN'T MAKE IT":FORT=1TO5000:NEXT:PRINT:GOTO6
519
3000 GOSUB9050:PRINT"J"
3001 POKE36869,240
3002 PRINT"   YOU  COLLAPSE BY"
3003 PRINT:PRINT"THE SIDE OF THE TRACK"
3004 PRINT:PRINT"YOU BURNT UP ALL YOUR"
3005 PRINT:PRINT"        ENERGY"
3006 PRINT:PRINT"  YOU BLEW THE WHOLE "
3007 PRINT:PRINT"         RACE"
3008 PRINT:PRINT" NOW YOU HAVE TO WAIT"
3009 PRINT:PRINT" ANOTHER 4 YEARS.....":PRINT:PRINT:PRINT
3010 GOSUB9000
3011 PRINT"J":END
5000 PRINT"J    TO GET  CHART OF"
5001 PRINT:PRINT"    OTHER AHTELETS    ":PRINT:PRINT:GOSUB9000
5005 PRINT" THESE ARE THE OTHERS ":PRINT"          TIMES"
5006 FORH=1TO900:NEXTH
5007 PRINT"J"
5014 PRINT" THE OTHERS QUALIFING ":PRINT
5015 PRINT" TIMES ARE AS FOLLOWS"
5016 FORL=1TO6
5017 QT=INT(RND(1)*3)
5018 DC=INT(RND(1)*9)+1
5019 LET QT=QT+8.9:LETDC=DC/10+.8:LETQT=QT+DC
5020 PRINT"TIME ";L;"= ";QT
5021 IF QT<DM/2.5THENLETPB=PB+1
5022 NEXTL
5023 PRINT"OVERALL YOU CAME ";PB+1:PRINT
5024 IFPB=0THENBS=60
5025 IFPB=1THENBS=40
```

(continued on next page)

(continued from previous page)



```
5026 IF PB=2THENBS=20
5027 IFPB>2THENBS=00
5028 PRINT"YOUR POSITION BONUS ":PRINT
5029 PRINT"IS ";BS;" ENERGY UNITS":PRINT
5030 JB=INT(RND(1)*50)
5031 PRINT"JUDGES BONUS ";JB;:PRINT:PRINT
5032 TB=JB+BS:LETRC=RC+1
5033 PRINT"        TOTAL    ";TB
5039 PRINT"   PREPARE FOR  FINAL"
5040 FOR TW=1TO7000:NEXT TW
5041 LETE=E+TB:LETPO=0:LETPW=190+INT(RND(1)*60):LP=0
5042 PRINT"J":POKE36869,255:GOSUB1000:GOTO10
5999 GOTO5999
6000 PRINT"J"
6001 POKE36869,240
6002 IF DM/2.5=<10THENGOTO6500
6003 IF DM/2.5=<10.8ANDDM/2.5>10THEN6600
6004 IF DM/2.5=<11.2ANDDM/2.5>10.8THEN6700
6005 IF DM/2.5>11.2THEN6800
6006 GOTO6002
6500 PRINT"J":GOSUB2000
6501 PRINT"";
6502 PRINT"
6503 PRINT"
6504 PRINT"
6505 PRINT"
6506 PRINT"
6507 PRINT"
6508 PRINT"            GOLD"
6509 PRINT"
6510 PRINT"
6511 PRINT"          YOU  GOT":PRINT
6512 PRINT"
6513 PRINT"
6514 PRINT"
6515 PRINT"
6516 PRINT"
6517 PRINT"
6518 PRINT"
6519 PRINT"   DO YOU WANT TO RUN"
6520 PRINT"    AGAIN (Y OR N)"
6521 GET Q$
6522 IF Q$="Y"THENRUN
6523 IF Q$="N"THENPRINT"J":END
6525 GOTO6521
6599 END
6600 PRINT"J":GOSUB2000
6601 PRINT"";
6602 PRINT"
6603 PRINT"
6604 PRINT"
6605 PRINT"
6606 PRINT"
6607 PRINT"
6608 PRINT"            SV
6609 PRINT"
6610 PRINT"              ":PRINT
6611 PRINT"       YOU GOT THE"
6612 PRINT:PRINT"      SILVER  MEDAL":PRINT
6613 GOTO6519
6699 GOTO6699
6700 PRINT"J":GOSUB2000
6701 PRINT"";
6702 PRINT"
6703 PRINT"
6704 PRINT"
6705 PRINT"
6706 PRINT"
6707 PRINT"
6708 PRINT"          BRONZE"
6709 PRINT"
6710 PRINT"
6711 PRINT:PRINT" YOU GOT BRONZE MEDAL":PRINT
5712 GOTO6519
6799 GOTO 6799
6800 PRINT"J":GOSUB2000
6801 PRINT"
6802 FORWS=1TO8
6803 PRINT"
6804 NEXTWS
6805 PRINT"
6806 PRINT"
6807 PRINT"
6808 PRINT"
6809 PRINT"          YOU              ON"
6810 PRINT"             THE WOODEN SPOON"
6811 PRINT:PRINT"  YOU DIDN'T MAKE A":PRINT
6812 PRINT"       MEDAL POSITION":PRINT
6813 GOTO6519
6899 GOTO6899
9000 PRINT"          HIT SPACE"
9001 FORT=1TO500:NEXTT
9002 PRINT"J         HIT SPACE"
9003 FORT=1TO500:NEXTT
9004 PRINT"J";
9005 GETKEY$:IFKEY$=""THEN9005
9006 RETURN
9050 FORD=1TO2
9051 FORSC=212TO165STEP-1:POKE36874,SC:FORT=1TO20:NEXTT:NEXTSC
9052 POKE36874,0
9054 NEXTD
9055 RETURN
```

Picasso's paintbrush

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PICASSO'S PAINTBRUSH is a multi-feature drawing program for the BBC Micro. Impressive pictures can be created quickly and easily using the many built-in functions.

- Automatic circle, triangle, semi-circle, rectangle and elipse drawing routines.
- Extensive colour mixing.
- Three cursor speeds.
- Three line thicknesses.
- Rubber band facility.
- Load and Save screens.
- Spray colour option.
- Print text anywhere on the screen.
- Colour-fill routine.
- Full MODE2 colour graphics.

Program 1 contains full instructions of how to operate these functions and the keys involved — all 30 of them. There are three methods of colour mixing provided, all of which are very easy to use.

The first way is to fill the area involved in one of the two colours to be mixed — e.g., red — and then to overlay it with alternate pixels of the second colour — e.g., yellow. The combination of Red and yellow produces a very good orange.

The second way is the same as above, but to overlay with horizontal lines — e.g., A darker orange may be produced using this method. The final method is to use high GCOL values to produce "hatching". On pressing the specified key, you must enter this value — e.g., 198 produces a good brown, when the colour is set to white.

Copies of the program are available for £3.50 from: M. J. Sillett, 41, College Rd., Dulwich, London SE21.

```
10*KEY10OLD|MRUN|M
20ONERROR RUN
30MODE7:DIMA%(9,10),H%(8),AD%(8),B%(3,1),C%(2,1,3),D%(1,1,1),E%(1),V%(8),F%(1
,1):QZ%=0:GS=0:CM%=0:OO%=4:O%=4:Q%=0:PA%=0:C=0:HH%=1:SS%=0:FS%=0:*FX4,1
40VDU23,241,255,254,254,252,252,248,248,240,23,240,255,127,127,63,63,31,31,15
,23,242,15,7,7,3,3,1,1,0,23,243,240,224,224,192,192,128,128,0
50FF%=1:CP%=1:Y$="Green":B$="Pink"
60VDU23,244,1,3,15,31,63,63,127,127,23,245,128,192,224,248,252,252,254,254,23
,246,127,127,255,255,255,255,127,127
70VDU23,247,254,254,255,255,255,255,254,254,23,248,127,127,63,63,31,15,3,1,23
,249,254,254,252,252,248,224,192,128
80PRINT:PRINTSPC(12)CHR$(141)CHR$(134)"FOUR IN A ROW":PRINTSPC(12)CHR$(141)CH
R$(133)"FOUR IN A ROW":FORX=1TO20:PRINTCHR$(131)"*";:NEXT:FORX=4TO20:PRINTTAB(0,
X)CHR$(131)"*"
90PRINTTAB(38,X)CHR$(131)"*":NEXT:PRINTTAB(0,20)"":FORX=1TO20:PRINTCHR$(131)"
*";:NEXT:VDU28,2,20,38,4
100PRINTTAB(10,4)"BY MARTIN ROBERTS":PRINTTAB(12,8)"COPYRIGHT 1984"
110PRINTTAB(6,14)"Do you want instructions";
120A$=GET$:IFA$="N"THEN140
130IFA$<>"Y"ANDA$<>"N"THENPRINTTAB(6,14)SPC(8)"Y/N Please"SPC(6):PROCDELAY:GOT
O110
140CLS
150IFA$="N"THEN220
160PRINT:PRINT"  This two player game consists of     stacking coloured discs i
n a 9 by 8  grid.":PRINT
170PRINT" The object of the game is for you    to get four of your discs in a
row,  vertically, horizontally or           diagonally."
180PRINT:PRINT" The cursor is moved by pressing the  left and right arrow keys
 and a      move is made by pressing the          downward arrow key."
190PRINT:PRINT" Press any key to continue";:A$=GET$:CLS
200PRINT:PRINT" In two player mode, a move may be    retracted by pressing the
 upward     arrow key."
210PRINT:PRINT" Press any key to continue";:A$=GET$:CLS
220PRINTTAB(6,1)"Are you using a colour":PRINTTAB(12,3)"telivision?";:A$=GET$:
PRINTA$:IFA$<>"N"ANDA$<>"Y"THENCLS:PRINTTAB(11,1)"(Y/N) Please":PROCDELAY:GOTO22
0
230IFA$="N"THENB$="White":Y$="Grey":Q%=1
240PRINTTAB(10,5)"(1=";B$;",2=";Y$;")":PRINTTAB(7,7)"First players colour?";:A
$=GET$:NB%=VAL(A$):PRINTA$:IFNB%<>1ANDNB%<>2THENPRINTTAB(7,7)"    1 or 2 please
   ":PROCDELAY:GOTO240
250K8%=1:F$=Y$:S$=B$:IFNB%=1THENF$=B$:S$=Y$:K8%=2
260PRINTTAB(1,9)"Do you want to play the computer?";:A$=GET$:PRINTA$:PRINT:IFA
$<>"N"ANDA$<>"Y"THENPRINTTAB(1,9)SPC(10)"(Y/N) please"SPC(12):PROCDELAY:GOTO260
270IFA$="N"THENPRINT:PRINTSPC(6)"Press any key to begin -";:A$=GET$:GOTO310
280PRINTTAB(6,11)"Do you want to go first?";:A$=GET$:PRINTA$:IFA$<>"N"ANDA$<>"
Y"THENPRINTTAB(1,11)SPC(10)"(Y/N) please"SPC(11):PROCDELAY:GOTO280
290I%=1:IFA$="Y"THENCP%=2:I%=0
300PRINT:PRINTTAB(5,13)"Type difficuty factor (1-5)";:DF$=GET$:DF%=VAL(DF$):PR
INTDF$:CM%=1:IFDF%>5ORDF%<1THENPRINTTAB(5,13)SPC(3)"Between 1 and 5 please"SPC(1
1):PROCDELAY:GOTO300
310RESTORE:FORR%=0TO9:FORJ%=0TO10:A%(R%,J%)=0:NEXT:NEXT:FORR%=0TO8:AD%(R%)=0:H
%(R%)=0:NEXT:LF%=0
320FORI%=0TO10:A%(9,I%)=3:A%(0,I%)=3:NEXT
330FORI%=0TO9:A%(I%,0)=3:A%(I%,10)=3:NEXT
340FORI%=0TO3:READB%(I%,0):READB%(I%,1):NEXT
350FORI%=0TO1:FORJ%=0TO1:FORK%=0TO1:READC%(I%,J%,K%):NEXT:NEXT:NEXT
360FORI%=0TO1:FORJ%=0TO1:FORK%=0TO1:READD%(I%,J%,K%):NEXT:NEXT:NEXT
370READE%(0),E%(1)
380READF%(0,0),F%(1,0),F%(0,1),F%(1,1)
390IFFF%=1THENFF%=2 ELSEFF%=1
400MODE5:VDU19,3,4,0,0,0,19,2,2,0,0,0,19,1,5,0,0,0,23;8202;0;0;0;
410IFY$="Grey"THENVDU19,1,7,0,0,0
420VDU28,0,28,19,2:COLOUR131:CLS:COLOUR0
```

```
430FORX=1TO17STEP2:FORY=2TO23STEP3:PROCDISK:NEXT:NEXT
440Y=0:FORX=1TO18STEP2:PROCPOINTER:NEXT:H%=0
450I%=FF%:X=OO%*2+1:GOTO530
460IFCM%=1ANDCP%=X%THEN920
470A$=INKEY$(0):IFASC(A$)=137THENO%=O%+1:IFO%=9THENO%=8
480IFASC(A$)=139ANDHH%=0ANDCM%=0THENA%(H%(E%),E%+1)=0:H%(E%)=H%(E%)-1:X=E%*2+1
:FORY=23-H%(E%)*3TO2STEP-3:PROCC:PROCDISK:COLOUR0:PROCDISK:SOUND1,-10,Y*30,1:NEX
T:HH%=1:LF%=LF%-1:O%=E%:PROCC1
490IFASC(A$)=136THENO%=O%-1:IFO%=-1THENO%=0
500IFASC(A$)=138ANDH%(O%)<8THENE%=O%:GOSUB560:OO%=O%:HH%=0:GOTO530
510IFO%<>OO%THENCOLOUR0:X=OO%*2+1:PROCPOINTER:X=O%*2+1:COLOURHC%:PROCPOINTER:O
O%=O%
520GOTO460
530IFX%=1THENCOLOURK0%:HC%=K0%:X%=2 ELSECOLOURN0%:HC%=N0%:X%=1
540PROCPOINTER
550GOTO460
560H%(O%)=H%(O%)+1
570A%(H%(O%),O%+1)=X%:X=O%*2+1:FORY=2TO26-H%(O%)*3STEP3:COLOURHC%:PROCDISK:COL
OUR0:PROCDISK:NEXT:COLOURHC%:Y=26-H%(O%)*3:PROCDISK
580SOUND1,-15,H%(O%)*30,2:Y=0
590FORY=1TO1000:NEXT
600*FX21,0
610Q%=0
620K%=1:VL%=0
630P%=A%(H%(O%)+B%(Q%,1)*K%,(O%+1)+B%(Q%,0)*K%)
640IFP%<>X%THEN670
650IFK%>0THENK%=K%+1:GOTO630
660K%=K%-1:GOTO630
670IFK%>0THENVL%=K%:TP%=K%-1:K%=-1:GOTO630
680VL%=VL%-K%
690IFVL%>4THEN730
700Q%=Q%+1:IFQ%<4THEN620
710LF%=LF%-1:IFLF%=72THENMODE7:PRINTTAB(0,8)"The game is drawn":GOTO850
720RETURN
730FORY%=1TO110STEP20:SOUND1,-15,Y%,Y%/20+2:NEXT:FORY%=110TO1STEP-20:SOUND1,-1
5,Y%,7-Y%/20+2:NEXT:E%=0
740R%=K%+1
750IFE%=0THENCOLOUR0:GOTO770
760COLOURHC%
770X=1+(O%-B%(Q%,0)*R%)*2:Y=26-(H%(O%)+B%(Q%,1)*R%)*3:PROCDISK
780FORI=1TO200:NEXT
790IFINKEY(0)<>-1THEN830
800R%=R%+1:IFR%<TP%+1THEN750
810IFE%=0THENE%=1:GOTO740
820E%=0:GOTO740
830MODE7:IFX%=1THENFS%=FS%+1:W$=F$ ELSEW$=S$:SS%=SS%+1
840PRINTTAB(1,6)W$" Wins":PRINT:PRINT"The score is "F$"="STR$(FS%)","S$"="STR$
(SS%):PRINT
850G%=1:PRINTTAB(0,10)"Would you like another go?";:A$=GET$:IFA$<>"Y"ANDA$<>"N
"THENPRINTTAB(0,10)SPC(8)"Y/N Please"SPC(8):PROCDELAY:GOTO850
860IFA$="Y"THEN310
870MODE7:END
880DATA1,-1,1,1,0,-1,1,0
890DATA10,12,30,35,5,6,20,25
900DATA29,33,20,31,125,1625,175,2125,625,625,13000,6000,-2000,-6000
910DEFPROCDELAY:SOUND1,-15,50,10:FORX=1TO1000:NEXT:ENDPROC
920DB%=0:HV%=-30000
930IFLF%=0THENHP%=INT(RND(1)*2)+4:GOTO1980
940PS%=0:C2%=1:W%=2
950IFX%=2THENC2%=2:W%=1
960FORI%=0TO8:V%(I%)=0:NEXT
970FORI%=0TO8:H%=H%(I%)+1
980IFDF%<2THEN1000
990PR%=0:PA%=0:C%=W%:C3%=C2%:GOSUB1150
1000PR%=1:C%=C2%:C3%=W%:GOSUB1150
1010IFDF%<2THEN1060
1020H%=H%+1:PA%=1
1030IFH%>6ORDF%<3THEN1060
1040GOSUB1150
1050PR%=0:C%=W%:C3%=C2%:GOSUB1150
1060NEXTI%
1070FORI%=0TO8:V%(I%)=V%(I%)+AD%(I%):NEXT
1080FORI%=0TO8
1090IFHV%=V%(I%)ANDRND(1)>.5THENHP%=I%
1100IFHV%<V%(I%)THENHV%=V%(I%):HP%=I%
1110NEXTI%
1120IFDB%=1ANDHP%=PS%THENAD%(TY%)=625:DB%=0
1130GOTO1980
1140REMFINDVAL
1150IFA%(H%,I%+1)=3THENV%(I%)=-30000:RETURN
1160FORJ%=0TO3
1170A%=B%(J%,1):B%=B%(J%,0)
1180K%=0:D%=0:N%=1:BL%=0
1190P%=A%(H%+A%*K%,I%+1+B%*K%)
1200D%=D%+1
1210IFP%=3ORP%=C%THEND%=D%-1:GOTO1960
1220IFP%=C3%THENN%=N%+1
1230IFN%=4THEN1920
1240IFD%=4THEN1280
1250IFK%>-1THENK%=K%+1:GOTO1190
1260K%=K%-1:GOTO1190
1270REMNO BOUNDRY
1280M1%=0:M2%=0:CT%=0:R%=0
1290IFN%>3THEN1920
1300IFDF%<4THEN1620
1310IFK%=3THENM%=0:SF%=3:GOTO1330
1320M%=M%-3:R%=M%
1330M%=M%-1:CT%=CT%+1:IFCT%>SF%THEN1430
1340Q%=A%(H%+A%*M%,I%+1+B%*M%)
1350P%=A%(H%+A%*(M%+4),I%+1+B%*(M%+4))
1360IFQ%=3ORQ%=C THEN1430
1370IFQ%=C3%ANDP%=0THEN1400
1380IFQ%=0ANDP%=C3%THENM1%=M1%-1
1390GOTO1330
1400M1%=M1%+1
1410IFM1%>M2%THENM2%=M1%:R%=M%
1420GOTO1330
1430N%=N%+M2%:IFN%<2THEN1640
1440IFN%>3THEN1920
1450F0%=0:H1%=H%:N7%=0:FORK%=R%TOR%+3:IFA%(H%+A%*K%,I%+1+B%*K%)=0THENPROCU:IFN1
%>N7%THENN7%=N1%
1460IFA%(H%-1+A%*K%,I%+1+B%*K%)<>0THENBL%=1
1470NEXT:IFN7%>3THENF0%=1
1480S%=0:T%=0:K%=1:M%=1:DP%=0:BF%=1
1490P%=A%(H%+A%*K%,I%+1+B%*K%)
1500IFP%=0THEN1550
1510IFP%=C%ORP%=3THENBF%=0:GOTO1550
1520M%=M%+1
1530IFK%>0THENK%=K%+1:GOTO1490
1540K%=K%-1:GOTO1490
1550IFK%>0THENS%=K%:K%=-1:GOTO1490
1560T%=K%:IFBF%=0ANDF0%=1THEN1640
1570IFN%<>M%ORBF%=0THEN1610
1580IFA%(H%-1+A%*S%,I%+1+B%*S%)<>0ANDA%(H%-1+A%*T%,I%+1+B%*T%)<>0THENDP%=1
1590IFPA%=1THENV%(I%)=V%(I%)-D%(N%-2,PR%,DP%):GOTO1610
1600V%(I%)=V%(I%)+D%(N%-2,PR%,DP%)
1610IFN%=3THEN1820
1620IFN%<2THEN1640
1630IFPA%=1THENV%(I%)=V%(I%)-C%(BL%,N%-2,PR%) ELSEV%(I%)=V%(I%)+C%(BL%,N%-2,PR%
)
1640NEXTJ%:RETURN
1650DEFPROCU:N1%=0:L%=0
1660M%=0:L3%=0
1670P%=A%(H1%+K%*A%+B%(L%,1)*M%,I%+1+B%*K%+B%(L%,0)*M%)
1680IFP%<>0ANDM%=0THENENDPROC
1690IFM%=0THEN1710
1700IFP%<>C3%THEN1740
1710L3%=L3%+1
1720IFM%>-1THENM%=M%+1:GOTO1670
1730M%=M%-1:GOTO1670
1740IFM%>-1THENM%=-1:GOTO1670
1750IFN1%<L3%THENN1%=L3%
1760L%=L%+1:IFL%<4THEN1660
1770IFN1%>3THENDP%=1:ENDPROC
1780DP%=0:ENDPROC
1790DEFPROCT:H1%=H%+1:PROCU
1800IFDP%=1THENENDPROC
1810H1%=H%-1:PROCU:ENDPROC
1820DP%=0
1830IFDF%<5THEN1640
1840A%(H%,I%+1)=C3%
1850IFA%(H%+A%*S%,I%+1+B%*S%)=0THENK%=S%:PROCT:IFDP%=1THENQ%=K%:GOTO1880
1860IFA%(H%+A%*T%,I%+1+B%*T%)=0THENK%=T%:PROCT:IFDP%=1THENQ%=K%:GOTO1880
1870A%(H%,I%+1)=0:GOTO1630
1880IFPA%=0THENV%(I%)=V%(I%)+E%(PR%):GOTO1900
1890V%(I%)=V%(I%)-E%(PR%)*.7
1900A%(H%,I%+1)=0:PS%=I%:TY%=I%+B%*Q%:IFPA%=0ANDPR%=0THENDB%=1
1910GOTO1640
1920V%(I%)=V%(I%)+F%(PR%,PA%)
1930IFPA%=0ANDPR%=0THENI%=8
1940GOTO1640
1950REM HIT
1960IFK%>-1THENM%=K%-1:SF%=M%:K%=-1:GOTO1190
1970GOTO1640
1980J%=-1
1990IFHP%>O%THENJ%=1
2000FORI%=O%TOHP%STEPJ%
2010X=I%*2+1:PROCPOINTER
2020COLOUR0
2030FORY=1TO100:NEXT
2040X=I%*2+1:PROCPOINTER
2050COLOURHC%
2060NEXT
2070X=(I%-J%)*2+1:PROCPOINTER
2080O%=HP%:GOSUB560:GOTO530
2090DEFPROCPOINTER:PRINTTAB(X,0)CHR$(240)CHR$(241):PRINTTAB(X,1)CHR$(242)CHR$(2
43):ENDPROC
2100DEFPROCDISK:PRINTTAB(X,Y)CHR$(244)CHR$(245):PRINTTAB(X,Y+1)CHR$(246)CHR$(24
7):PRINTTAB(X,Y+2)CHR$(248)CHR$(249):ENDPROC
2110DEFPROCC:IFX%=1THENCOLOURK0% ELSECOLOURN0%
2120ENDPROC
2130DEFPROCC1:IFX%=1THENCOLOURK0%:HC%=K0%:X%=2 ELSECOLOURN0%:HC%=N0%:X%=1
2140X=O%*2+1:COLOURHC%:PROCPOINTER
2150ENDPROC
```

QL Trace

B J White,
Wirral,
Merseyside.



THOSE OF YOU who know what a trace is may skip this paragraph. A trace shows the line number and line details which the program is using at that instant and at the same time allows the program to proceed normally or if wished slower — down to frame by frame to use a video recorder analogy. Thus the programs of others may be followed for quicker understanding and one's own followed at leisure to find where a problem occurs. Errors in typing out printed listings can also be most readily found with a trace particularly if the programs are not fully understood. This program uses as narrow a window as possible at the top of the screen to show the instantaneous listing, long lines are not shown in full.

A trace showing where you were in a program along with control of speed of the program is, or was, the province of machine code and a fairly long one at that. Trace was supposed to be on the early QLs but it is not there now and I have not seen one for sale. This QL trace is so much easier than guessing where to put all the prints and stops to find out where one is in a program.

The typing amount is not as bad as it looks because Del-Trace is constructed from a renumbered d-lined Init-Trace and merged back with first parts. Take care with the string statements, it is easiest to think out the "" and $ rather than copy. Remember you can join any $ with anything within "" and the join must be &, nothing else can be joined or used for joining. The QL reads the instruction as if none of the "" nor the $ nor the & were there. There is only one character recorded in a line that you do not get printed on screen and that is the CHR$(10) forcing new line hence its appearance in the program when additional lines are put in by program and its presence being used to determine the end of a program line so a new one may be collected.

Init-Trace: These headings are procedures and called by entering like a direct command. QLTrace requires a blank line after every program line so it can insert its call for tracing. Renumber your program line so it can insert its call for tracing. Renumber your program on the QL if necessary. Load QLTrace and put cassette with your program in either drive. Run and answer questions, which drive your prgram is in, name of your program, and final line you wish to trace — QLTrace stops at the end anyway. The modified program will now be on the same cassette and named the same except it has a T in front for trace. Note the T program is not

(continued on next page)

(continued from previous page)

in the computer.

Trace 1 or 0: Load the program when required. Enter Trace 1 for trace on, Trace 0 for trace off. Run your Tprogram. The stepping is by holding down Shift and Ctrl with Press of V.

Del-Trace: After modification using QLTrace you can strip the Tprogram clean if wished. Place a cassette with Tprogram in any drive, run QLTrace and find similar questions to Init-Trace. The new ordinary program will be on the same cassette, the old one is deleted, but the Tprogram is kept ready for future use.

Other windows can interfere, so modify either position. Inkey$ polls covering the weird choice of CHR$(182) used in program will need modifying. Trace 1 or Trace 0 must be entered before running the Tprogram or it will stop. Progress of Init- and Del-Trace is shown on screen so hic-cups can be seen. Lines jumped from are not shown.

```
20000 REMark COMPACT "QL" TRACE
20010 REMark ********************
20020 REMark COPYRIGHT B.J.WHITE 1984
20030 REMark **************************
20040 REMark ENTER INIT_TRACE if not done before to the exact listing.
20050 REMark ****************************
20060 REMark  ENTER TRACE 1 for trace and TRACE 0 for trace off.
20070 REMark ****************************
20080 DEFine PROCedure init_trace
20090 REMark **************************
20100   LOCal asc,char$,Progr$,lines$,drive$,linenumber$,count,lnum,nlnum,nlnum$
20110 INPUT #0,"In which drive is Program ? " ! ; drive$
20120 INPUT #0,"What is name of Program ? "; ! Progr$
20130 INPUT #0,"Final linenumber to trace ? "; ! flinenumber
20140 DELETE "mdv"&drive$&"_"&"t"&Progr$
20150 OPEN #10,"mdv"&drive$&"_"&Progr$
20160 OPEN_NEW #11,"mdv"&drive$&"_"&"t"&Progr$
20170 REPeat text_loop
20180  lines$ = "" : linenumber$ = "": count = 1
20190 REPeat line_loop
20200   char$ = INKEY$(#10,-1)
20210   asc = CODE(char$)
20220      SELect ON asc
20230      ON asc = 48 TO 57
20240      IF count <= 5
20250         linenumber$ =linenumber$&char$
20260      END IF
20270      END SELect
20280   count = count + 1
20290   lnum = linenumber$ : nlnum = lnum + 1 : nlnum$ = nlnum
20300    lines$ = lines$&char$
20310   SELect ON asc = 10 : PRINT #11,lines$!: PRINT lines$!   : PRINT #11, nlnum$&" TRACK "&linenumber$&CHR$(10)! : EXIT line_loop
20320 END REPeat line_loop
20330   IF EOF(#10)  THEN EXIT text_loop
20340   IF lnum >= flinenumber THEN EXIT text_loop
20350 END REPeat text_loop
20360 CLOSE #11
20370 CLOSE #10
20380 END DEFine init_trace
20390 DEFine PROCedure trace(n)
20400 REMark ********************
20410  IF n = 1 THEN control = 1: ELSE control = 0
20420 END DEFine trace
20430 DEFine PROCedure track(n)
20440 REMark ********************
20450 IF control = 1
20460 OPEN #12,scr_480x10a30x15
20470 PAPER #12,4:INK #12,0:CLS #12
20480 LIST #12,n
20490 CLOSE #12
20500 REPeat step_loop
20510   stp$ = INKEY$(#1,-1)
20520   IF  stp$ = CHR$(182) THEN EXIT step_loop
20530 END REPeat step_loop
20540 END IF
20550 END DEFine track
20560 DEFine PROCedure del_trace
20570 REMark ************************
20580   LOCal asc,char$,tProgr$,Progr$,lines$,drive$,linenumber$,count,lnum,olnum,olnum$
20590 INPUT #0,"In which drive is Program for delete trace ? " ! ; drive$
20600 INPUT #0,"What is the name of tProgram for del_trace ? " !; tProgr$
20610   Progr$ = tProgr$(2 TO )
20620 INPUT #0,"Final linenumber to del_trace ? "; ! flinenumber
20630 DELETE "mdv"&drive$&"_"&Progr$
20640 OPEN #10,"mdv"&drive$&"_"&tProgr$
20650 OPEN_NEW #11,"mdv"&drive$&"_"&Progr$
20660 REPeat text_loop
20670  lines$ = "" : linenumber$ = "": count = 1
20680 REPeat line_loop
20690   char$ = INKEY$(#10,-1)
20700   asc = CODE(char$)
20710      SELect ON asc
20720      ON asc = 48 TO 57
20730      IF count <= 5
20740         linenumber$ =linenumber$&char$
20750      END IF
20760      END SELect
20770   count = count + 1
20780   lnum = linenumber$ : olnum = lnum - 1 : olnum$ = olnum
20790    lines$ = lines$&char$
20800   SELect ON asc
20810   ON asc = 10
20820      IF lines$ = linenumber$&" track "&olnum$&CHR$(10)
20830         lines$ = ""
20840      ELSE  PRINT #11,lines$;
20850      PRINT lines$;
20860      END IF
20870      EXIT line_loop
20880   END SELect
20890 END REPeat line_loop
20900   IF EOF(#10)  THEN EXIT text_loop
20910   IF lnum >= flinenumber THEN EXIT text_loop
20920 END REPeat text_loop
20930 CLOSE #11
20940 CLOSE #10
20950 END DEFine del_trace
```

Lightcycle

Andy Sheppard,
Burnkey,
Lancashire.



THE PROGRAM is in two parts: A short Basic controller program and 2K of machine code, containing the game routine, and various other routines for instructions etc. plus data for a redefined character set.

Loading and Saving instructions: Type in the Basic program — listing 1 — and Save it — without attempting to Run it — by using

SAVE "LIGHTCYCLE" LINE 9997

Next, either: Enter the machine code from the assembly listing — listing 2 — or enter the machine code from the hex-dump — listing 3 — using the hex-loader — listing 4:

If by this time you have had enough of typing in the hex., then you have no need to enter listing 5, which is data for a new character set : if this is the case, then delete the statement

POKE 23607,116

from line 9997 in listing 1.

If you *do* want to use the new character set, then type in the hex. from listing 5 using the hex-loader, inputting "7580" as the start address.

When all the code has been entered and checked, save the code using

SAVE "0" CODE 28672,2100

immediately after where listing 1 was Saved. After Verifying , type

RANDOMIZE USR 0

to clear the computer. Rewind the tape and type

LOAD "LIGHTCYCLE"

The Basic will auto-Run, Loading the machine code. If the program crashes, reload the hex-loader and further check the code using the List option of the loader.

Keyboard layout.

Either:

1) Joysticks in ports 1 and 2 of the ZX Interface II

or 2)

Direction	Player 1	Player 2
Up	W	P
Down	Z	Space
Left	A	L
Right	S	Enter

```
  0>REM  ----------------------
  0>REM     BASIC control for
  0>REM      "LIGHTCYCLE" by
  0>REM       Andy Sheppard
  0>REM      December 1983
  0>REM  ----------------------
  0>REM
  10 LET s1=0: LET s2=s1: BORDER
 0: POKE 23693,7: CLS : PRINT #0
;AT 1,0; FLASH 1; BRIGHT 1;"  PR
ESS SPACE KEY TO CONTINUE.  ": P
RINT : LET z=USR 29359: PRINT #0
;AT 1,0,,
  20 PRINT AT 3,5;"PLAYER 1 COLO
UR ? [1-7]": PAUSE 0: LET a$=INK
EY$: IF a$<"1" OR a$>"7" THEN GO
 TO 20
  30 POKE 28671,VAL a$: POKE 286
76,VAL a$: LET z=USR 29799
  40 PRINT AT 5,5;"PLAYER 2 COLO
UR ? [1-7]": PAUSE 0: LET a$=INK
EY$: IF a$<"1" OR a$>"7" THEN GO
 TO 40
  50 POKE 28671,VAL a$: POKE 286
77,VAL a$: LET z=USR 29824
  60 PRINT AT 7,5;"SPEED ? [0-9,
0=FASTEST]": PAUSE 10: LET a$=IN
KEY$: IF a$<"0" OR a$>"9" THEN G
O TO 60
 100 RANDOMIZE : POKE 28679,4*VA
L a$: PRINT : LET z=USR 29471: P
AUSE 0: LET z=USR (28680+33*(RND
>.49)): LET s1=s1+(PEEK 23681=2)
: LET s2=s2+(PEEK 23681=1): PRIN
T AT PEEK (28673+2*(PEEK 23681=2
)),PEEK (28672+2*(PEEK 23681=2))
; BRIGHT 1; FLASH 1; PAPER 6; IN
K 2;"R": BEEP 1,-40: GO SUB 1000
: IF s1=10 OR s2=10 THEN PAUSE 1
: CLS : GO TO 130
 120 GO SUB 2000: GO TO 100
 129 REM Game over
 130 GO SUB 1000: PRINT AT 21,5;
"PLAYER ";1+(s2=10);" IS THE WIN
NER!";#0;AT 1,0;"PRESS SHIFT KEY
 FOR ANOTHER GAME": LET z=USR 29
674: RUN
 999 REM Print scores
1000 PRINT AT 6,11;"PLAYER 1:";s
1;AT 15,11;"PLAYER 2:";s2: RETUR
N
2000 PRINT AT 21,0; PAPER RND*7;
 INK 9; FLASH 1; BRIGHT 1;"  PRE
SS ANY KEY FOR NEXT DUEL.  ": PA
USE 0: CLS : RETURN
9990 REM --------------------
9991 REM AUTORUN FROM LINE 9997
9992 REM --------------------
9993 REM
9994 REM Miss out POKE in line
```

(continued on next page)

(continued from previous page)

```
          9997 if new character
          set is not to be used.
9995 REM
9996 REM
9997 CLEAR 28000: LOAD "0"CODE 2
8672,2100: POKE 23607,116: RUN
9998 PAUSE 100: POKE 23736,181:
SAVE "LIGHTCYCLE" LINE 9997: POK
E 23736,181: SAVE "0"CODE 28672,
2100: GO TO 9998
9999 VERIFY "LIGHTCYCLE": VERIFY
 "0"CODE 28672,2100
```

```
28672:  040A180A01046500 = 157
28680:  CD7671CD9470CD4E = 1184
28688:  707D2A0070FE01CA = 848
28696:  EA70FE02CAF070FE = 1410
28704:  03CAED70FE04CAF3 = 1257
28712:  70CDBF70CD71707D = 1175
28720:  2A0270FE01CA0D71 = 739
28728:  FE02CA1371FE03CA = 1049
28736:  1071FE04CA1671CD = 929
28744:  541FD8C30870FD6E = 1009
28752:  763EF7D8FECB5F20 = 1230
28760:  022E01CB4F20022E = 411
28768:  02CB5720022E03CB = 578
28776:  4720022E04FD7576 = 643
28784:  C9FD6E773EEFD8FE = 1457
28792:  CB4F20022E01CB5F = 661
28800:  20022E02CB572002 = 406
28808:  2E03CB6720022E04 = 439
28816:  FD7577C9FD6E763E = 1233
28824:  FBD8FECB4F20022E = 1086
28832:  013EFDD8FECB4F20 = 1095
28840:  022E04CB4F20022E = 414
28848:  023EFED8FECB4F20 = 1105
28856:  022E03FD7576C9FD = 993
28864:  6E773EDFD8FECB47 = 1261
28872:  20022E013EBFD8FE = 807
28880:  CB4F20022E04CB47 = 640
28888:  20022E023E7FD8FE = 744
28896:  CB4720022E03FD75 = 727
28904:  77C9251807241804 = 452
28912:  2C18012D220070E5 = 489
28920:  CD3071E1200A3A04 = 695
28928:  705FCD4471C32970 = 941
28936:  FD364701C9251807 = 648
28944:  2418042C18012D22 = 212
28952:  0270E5CD3071E120 = 966
28960:  0A3A05705FCD4471 = 666
28968:  C30870FD364702C9 = 896
28976:  457C0F0F0F4FE6E0 = 771
28984:  086F79E603EE5867 = 1062
28992:  7ECB77C93E11D77B = 1066
29000:  D73E13D73E01D73E = 851
29008:  16D77CD77DD73E20 = 1010
29016:  D724E5CD3071E1C0 = 1263
29024:  3E11D77BD73E13D7 = 928
29032:  3E00D73E16D77CD7 = 915
29040:  7DD73E20D7C9ED4B = 1162
29048:  06700878B120FBC9 = 910
29056:  1F47202020544849 = 427
29064:  53204953204C2049 = 484
29072:  2047204820542043 = 422
29080:  2059204320 4C2045 = 429
29088:  2021202020202020 = 257
29096:  202020544845204F = 432
29104:  424A454354204F46 = 541
29112:  204C494748544359 = 564
29120:  434C452049532054 = 516
29128:  4F20535445455220 = 530
29136:  594F555220435943 = 590
29144:  4C452041524F554E = 566
29152:  4420544845204752 = 510
29160:  494420574954484F = 563
29168:  5554204352415348 = 570
29176:  494E4720494E544F = 568
29184:  2045495448455220 = 513
29192:  544845205741 4C4C = 561
29200:  204F522041205641 = 473
29208:  504F555220545241 = 589
29216:  494C2E2020202020 = 355
29224:  202020202020424F = 337
29232:  5448204359434C45 = 556
29240:  53204C4541564520 = 512
29248:  41205641504F5552 = 574
29256:  20545241494C2041 = 509
29264:  4E44204E45495448 = 554
29272:  4552204359434C45 = 551
29280:  2043414E2053544F = 520
29288:  5020554E54494C20 = 540
29296:  4F4E4520504C4159 = 568
29304:  4552204841532043 = 502
29312:  524153484544 2E20 = 517
29320:  2020202020202020 = 256
29328:  2020202020202020 = 256
29336:  2020202020202020 = 256
29344:  2020202020202020 = 256
29352:  20202020202023CD = 432
29360:  7673CDFC72118271 = 1064
29368:  3E7FDBFE1F30153E = 824
29376:  16D73E00D73E1FD7 = 822
29384:  1AFE2328E813D7CD = 1026
29392:  E27218E43E16D7AF = 1066
29400:  D7AFD73E06D73E06 = 956
29408:  D7C90608C52A8071 = 910
29416:  0E08E50620A7CB16 = 681
29424:  2B10FBE1250D20F2 = 859
29432:  C110E9C9260E0602 = 703
29440:  C51E920602C52E1C = 652
29448:  3E16D77CD77DD706 = 984
29456:  047BD71C10FB24C1 = 866
29464:  10EB24C110E2C9CD = 1128
29472:  767311011321218F = 479
29480:  3E16D7AFD7AFD7CD = 1284
29488:  6C73CD6673CD7173 = 1078
29496:  211E91CD66730612 = 654
29504:  C5CD6C7321028FCD = 1008
29512:  6673CD7173211E90 = 857
29520:  CD66730110EACD6C = 1178
29528:  7321218FCD667321 = 779
29536:  2091CD66730945 7C = 993
29544:  D710FCC97AD77BD7 = 1359
29552:  C97AD7AFD7C92100 = 1162
29560:  7011967306041A77 = 549
29568:  231310FA219A73FD = 875
29576:  7541FD7442FD3676 = 1042
29584:  02FD367704C9040A = 647
29592:  180A010101010101 = 43
29600:  01FF55AA55AA55AA = 1021
29608:  55AA00000003070F = 280
29616:  1C31031F7FBFCEF1 = 876
29624:  1FC7B0DFBF7FFFFF = 1457
29632:  FCF10000C0E0F8FC = 1409
29640:  1FC727474F0F0F07 = 456
29648:  0701F7F3FB7BFBF0 = 1363
29656:  F0C0E7E7EFEFCF07 = 1586
29664:  0701F7F0F878F8F0 = 1351
29672:  F0C0210058110158 = 659
29680:  A73A047017171701 = 411
29688:  600177ED803A0570 = 804
29696:  17171701A00177ED = 587
29704:  B0783A0470110E04 = 503
29712:  CD2074D03A057011 = 753
29720:  0004CD2074D018E9 = 822
29728:  D3FE187A8320FB3E = 1138
29736:  FED8FE1FC93AFF6F = 1383
29744:  21205A0602C50420 = 398
29752:  772310FCC1C64010 = 893
29760:  F40600C5215F57CD = 867
29768:  5474213F57CD5474 = 788
29776:  C110F0C90E08E506 = 907
29784:  20A7CBC6CB162B10 = 884
29792:  FBE1250D20F0C911 = 1016
29800:  857421317 4CD9174 = 913
29808:  214574CD9174214B = 792
29816:  74CD9174CD2D74C9 = 1149
29824:  118B7418E5C059FF = 1061
29832:  4FDF4F205A5F573F = 748
29840:  5706021A77231310 = 310
29848:  FAC9 = 451
```

Raid

G Dobbing,
Stockton on Tees,
Cleveland.



THE OBJECT of the game is to move your shuttle down between the shields and capture the parts that are being sent to the humans own space station.

This may seem easy enough but the shields get faster and the more parts you collect the more shields appear. The parts also increase in speed as the game progresses.

There is also an "on screen" fuel gauge and this is used up each time you have to hit your rockets. The numbers of parts you have collected and how many ships you have left is shown on screen along with the remaining fuel.

The game also incorporates a freeze frame to allow you to leave your game for a while without coming back to find you have been destroyed. Instructions are included within the program.

If you find this too difficult you can make it easier by altering the number of parts you need to collect by changing the 'TP' variable in line 1250 to a smaller amount.

```
10 REM***TITLE PAGE***
20 CLS0
30 FORR=96 TO 100
40 PRINT@R,"r";
50 IF R>=97 THEN PRINT@R-1,CHR$(128);
60 PLAY"T255O1V31CV21CV11C"
70 NEXTR
80 FORA=14 TO 131 STEP32
90 PRINT@A,"a";
100 IF A>=32 THEN PRINT@A-32,CHR$(128);
110 PLAY"T255O1V31DV21DV11D"
120 NEXTA
130 FOR I=126 TO 112 STEP-1
140 PRINT@I,"i";
150 IFI<=125 THEN PRINT@I+1,CHR$(128);
160 PLAY"T255O1V31EV21EV11E"
170 NEXTI
180 FOR D=498 TO 97 STEP-32
190 PRINT@D,"d";
200 IF D<=466 THEN PRINT@D+32,CHR$(128);
210 PLAY"T255O1V31FV21FV11F"
220 NEXTD
230 PRINT@295,"press"+CHR$(128)+"the"+CHR$(128)+"space
bar";
240 FORR=0 TO 31
250 PRINT@R,CHR$(147);
260 PLAY"T255O4B"
270 NEXTR
280 IF PEEK(345)=223 THEN 650
290 FORR=63TO447STEP32
300 PRINT@R,CHR$(159);
310 PLAY"T255O4A"
320 NEXTR
330 IF PEEK(345)=223 THEN 650
340 FORR=479TO448STEP-1
350 PRINT@R,CHR$(156);
360 PLAY"T255O4G"
370 NEXTR
380 IF PEEK(345)=223 THEN 650
390 FORR=416TO32STEP-32
400 PRINT@R,CHR$(159);
410 PLAY"T255O4F"
420 NEXTR
430 IF PEEK(345)=223 THEN 650
440 FORR=0TO31
450 PRINT@R,CHR$(243);
460 PLAY"T255O4C"
470 NEXTR
480 IF PEEK(345)=223 THEN 650
490 FORR=63TO447STEP32
500 PRINT@R,CHR$(255);
510 PLAY"T255O4D"
520 NEXTR
530 IF PEEK(345)=223 THEN 650
540 FORR=479TO448STEP-1
550 PRINT@R,CHR$(252);
560 PLAY"T255O4E"
570 NEXTR
580 IF PEEK(345)=223 THEN 650
590 FORR=416TO32STEP-32
600 PRINT@R,CHR$(255);
610 PLAY"T255O3F"
620 NEXTR
630 IF PEEK(345)=223 THEN 650
640 IF PEEK(345)<>223 THEN 240
650 CLS0
660 SOUND180,1
670 PRINT@131,"do"+CHR$(128)+"you"+CHR$(128)+"want"+CH
R$(128)+"instructions";
680 PRINT@237,CHR$(123)+"y"+CHR$(124)+"n"+CHR$(125);
690 IF PEEK(339)=223 THEN GOSUB 2360 ELSE IF PEEK(344)
<>247 THEN 690
700 CLS0
710 SOUND210,1
720 PRINT@234,"please"+CHR$(128)+"wait";
730 REM***SET UP SCREEN***
740 BR$="BM126,10;R5D2R4D2R4D2R4D2R3U18R1D4R1D4R1D4R1D
4R2D2R2D6R2D3R2U7R6D2L4D14R5U4R4U4R23D1L5D1L4D2L6D4L2D
2L4D2L2D2L2D0R5U5R5D5R3U5R2D4R5D3L14D9R5U4R3D4R6D5L19U
3L3D3L5U5L3D5L5U5L3D9L5U5L3D5L4U3L2U11R2D4R4U4R2U4R4U3
L6D4L3U4L5D4L3U4L3"
750 SB$="BM126,10;L6D2L4D2L4D2L4D2L3U18L1D4L1D4L1D4L1D
4L2D2L2D6L2D4L2U8L6D2R4D14L5U4L4U4L23D1R5D1R6D1R6D4R2D
2R4D2R2D2R2D8L5U5L5D5L3U5L2D4L5D3R14D9L5U4L3D4L6D5R21U
3R3D3R4U5R3D5R5U9R3D9R5U5R3D5R4U3R2U18L2D4L4U4L2U4L4U3
R6D4R3U4R5D4R3U4R2"
760 EY$="BM100,30;R11D2R2D3R2D3L9U2L2U2L4U3"
770 YE$="BM150,30;L11D2L2D3L2D3R9U2R2U2R4U3"
780 FU$="BM5,189;U3R5L5U3R5BR3D4R5U4BR3R5L5D3R5L5D3R5B
R3R5L5U6"
790 MO$="BM0,167;R12F3D4F3R6E3R2E2R2F2R2F2R2F1R2E1R1E1
R1E1R1E1R2F2R5F3R6E2R4E3R3F3R6F2R3E3R7E2R5F1R3F1R3F3R7
E2R2F2R2E3R5E1R2E1F5R1E5R4F3R7F2E2R2E3R3E1F4R3F1R3E3R3E
3F3R6F3R5E3R6E1R1E1R1E1R2F2R2F2R2F2R2E4R5E1"
800 DIM A(10,10),B(10,10)
810 DIM C(10,5),D(10,5),E(10,10)
820 S3=1:S2=254:LV=4:B6=34:SP=2:H=6:S4=255
830 X=123:Y=50:X1=123:Y1=50:BD=255
840 Z=0:T=140:Z1=0:T1=140:FU=253
850 PMODE4,1:PCLS
860 LINE(40,187)-(FU,184),PSET,BF
870 DRAW"BM205,0;D10U5L5R10L5E3G6E3F3H6"
880 GET(200,0)-(210,10),E,G
890 LINE(200,0)-(210,10),PRESET,BF
900 DRAW"BM120,50;L1D4D3R1E2F1D1G1D1R3U1H1U1E1F2R1U3H4
L1"
910 PAINT(129,52),1
920 DRAW BS$
930 DRAW SB$
940 DRAW EY$+YE$
950 PAINT(128,11),1
960 DRAW FU$
970 DRAW MO$
980 DRAW"BM0,160;R180DSL180U5"
990 PAINT(2,162),1
1000 LINE(0,160)-(256,160),PSET
1010 PAINT(0,170),1
1020 GET(123,50)-(133,60),A,G
1030 GET(0,160)-(10,165),C,G
1040 PUT(0,0)-(10,10),A,PSET
1050 PUT(12,0)-(22,10),A,PSET
1060 PUT(24,0)-(34,10),A,PSET
1070 PSET(10,30):PSET(15,22):PSET(20,33):PSET(42,35):P
SET(200,10):PSET(205,3):PSET(240,20)
1080 PSET(15,40):PSET(10,45):PSET(30,50):PSET(210,50):
PSET(204,66):PSET(250,63)
1090 CIRCLE(240,40),4
1100 PAINT(240,40),1
1110 SCREEN1,1
1120 REM***MAIN LOOP***
1130 PSET(11,111):PSET(21,110):PSET(120,130):PSET(130,
145):PSET(124,90):PSET(133,85):PSET(200,83)
1140 PSET(60,99):PSET(63,113):PSET(50,87):PSET(200,90)
:PSET(233,110):PSET(245,122):PSET(153,100):PSET(160,13
0):PSET(220,144):PSET(220,139)
1150 IF Y<=55 THEN Y=55
1160 IF PEEK(341)=223 THEN Y=Y-4:FU=FU-.3:PRESET(FU,18
5):PRESET(FU,186)  ELSE Y=Y+4
1170 IF PEEK(343)=223 AND Y>=70 THEN X=X-8:FU=FU-.05:P
RESET(FU,185):PRESET(FU,186)
1180 IF PEEK(344)=223 AND Y>=70 THEN X=X+8:FU=FU-.05:P
RESET(FU,185):PRESET(FU,186)
1190 IF FU<40 THEN PLAY"T50O4V31C"
1200 PUT(X1,Y1)-(X1+10,Y1+10),B,PSET
1210 PUT(X,Y)-(X+10,Y+10),A,PSET
1220 IF X<=122 AND Y<=67 THEN Y=67
1230 IF X+10>=134 AND Y<=67 THEN Y=67
1240 IF Y<=51 THEN GOSUB 1560
1250 IF TP=6 THEN GOSUB 2210
1260 IF TP=2 THEN BB=1
1270 IF TP=4 THEN TT=1
1280 IF X+3>=Z AND X+7<=Z+10 AND Y+9>=T AND Y+9<=T+2 A
ND FY=0 THEN GOSUB 1630
1290 IF FU<=40 THEN GOTO 1960
```

(continued on next page)

(continued from previous page)

```
1300 IF X>=243 THEN X=243
1310 IF X<=3 THEN X=3
1320 IF Y>=168 THEN GOSUB 1800
1330 LINE(0,120)-(S3,120),PSET
1340 LINE(255,90)-(S2,90),PSET
1350 IF BB=1 THEN LINE(0,70)-(S1,70),PSET
1360 IF TT=1 THEN LINE(255,153)-(S4,153),PSET
1370 IF BB=1 THEN S1=S1+5:IF S1>=255 THEN GOSUB 1730
1380 IF TT=1 THEN S4=S4-3:IF S4<=0 THEN GOSUB 1760
1390 IF PA=0 THEN Z=Z+SP
1400 IF Z>=245 THEN Z=0
1410 IF S3<=120 THEN S3=S3+HH ELSE S3=S3+2
1420 IF S2>=120 THEN S2=S2-(HH-2) ELSE S2=S2-2
1430 IF S3>=255 THEN GOSUB 1670
1440 IF S2<=0 THEN GOSUB 1700
1450 IF X<=S3 AND Y<=120 AND Y+8>=120 THEN GOSUB 1800
1460 IF X+10>=S2 AND Y<=90 AND Y+8>=90 THEN GOSUB 1800
1470 IF BB=1 THEN IF X<=S1 AND Y<=70 AND Y+8>=70 THEN
GOSUB 1800
1480 IF TT=1 AND X>=S4 AND Y<=153 AND Y+8>=153 THEN GO
SUB 1800
1490 PUT(Z1,T1)-(Z1+10,T1+5),D
1500 IF PA=0 THEN PUT(Z,T)-(Z+10,T+5),C,PSET
1510 Z1=Z:T1=T
1520 X1=X:Y1=Y
1530 IF PEEK(341)=239 THEN SOUND200,3:SOUND100,2:GOSUB
2720
1540 GOTO1130
1550 REM***DELIVER SPARE PART***
1560 IF Y<=51 AND PA=1 THEN PLAY"T5V5AV7BV9CV11DV13EV1
5FV17G" ELSE RETURN
1570 TP=TP+1:BO=BO-8
1580 LINE(BO,2)-(BO+4,10),PSET,BF
1590 SP=SP+3:PA=0
1600 Y=51:HH=HH+2
1610 RETURN
1620 REM***COLLECT SPARE PART***
1630 PLAY"O3T4L5V30CT8CT6CD3T4GT8GT6GT4ET8ET6ET30":PA=
1
1640 LINE(Z,T)-(Z+10,T+5),PRESET,B:Z=0
1650 RETURN
1660 REM***ERASE SHIELDS***
1670 LINE(0,120)-(255,120),PRESET
1680 S3=1
1690 RETURN
1700 LINE(255,90)-(0,90),PRESET
1710 S2=255
1720 RETURN
1730 LINE(0,70)-(255,70),PRESET
1740 S1=0
1750 RETURN
1760 LINE(255,153)-(0,153),PRESET
1770 S4=255
1780 RETURN
1790 REM***CRASH***
1800 FORC=1TO3
1810 PUT(X,Y)-(X+10,Y+10),E,PRESET
1820 PLAY"T255V30O1CDEFG"
1830 PUT(X,Y)-(X+10,Y+10),E,PSET
1840 PLAY"T255V30O2CDEFG"
1850 NEXTC
1860 PLAY"T5O01V30V25V20V15V10V5V4V3V2V1DDDD
D"
1870 LINE(X,Y)-(X+10,Y+10),PRESET,BF
1880 IF Y>=170THEN LINE(X,Y+3)-(X+10,Y+10),PSET,BF
1890 LV=LV-1:X=123:Y=52
1900 PA=0
1910 IF LV=0 THEN GOTO 1960
1920 BS=BS-12
1930 LINE(BS,0)-(BS+10,10),PRESET,BF
1940 RETURN
1950 REM***ALL SHIPS LOST***
1960 CLS
1970 PRINT:PRINT
1980 FOR EN=1 TO 10
1990 CLS0
2000 PRINT@234,"you"+CHR$(128)+"blew"+CHR$(128)+"it";
2010 PLAY"T255V25O1CDEFG"
2020 CLS
2030 PLAY"T255V20O1CDEFG"
2040 NEXTEN
2050 CLS:PRINT:PRINT" DUE TO YOUR INCOMPETANCE THE
ENTIRE CREW OF YOUR BASE SHIP   HAVE PERISHED."
2060 FORL=160TO191
2070 PRINT@L,CHR$(131);
2080 NEXTL
2090 PRINT@288," TOTAL NO. OF PARTS OBTAINED: ";TP;
2100 PLAY"O2L2T5V30CCT10CT5CD#T10DT5DT10CT5CD1T10O2T3
C"
2110 FORL=416TO447
2120 PRINT@L,CHR$(131);
2130 NEXTL
2140 PRINT@448,"DO YOU WANT TO TRY AGAIN? (Y/N)"
2150 IF PEEK(339)=223 THEN SOUND150,5:RUN 650 ELSE IF
PEEK(344)<>247 THEN 2150
2160 CLS0
2170 SOUND1,8
2180 END
2190 GOTO2150
2200 REM***YOU DID IT***
2210 CLS0:PRINT:PRINT" WELL DONE."
2220 PRINT" YOU HAVE SUCCESSFULLY COMPLETED YOUR MISSI
ON. YOU CAN NOW      INSTALL THE PARTS AND GET HOME
SAFELY."
2230 PRINT
2240 FORL=224TO479
2250 PRINT@L,CHR$(140);
2260 NEXTL
2270 S$="L150O3O4AO4FF15O3AO4FF15O3AO4FF5"
2280 B$="FO8AFGAF15EGF15FF5"
2290 C$="O4DCO3BO4DFAF12GEDGF5"
2300 D$="O4FGO8AFGAF15FGF15AFGAF15FGF15"
2310 E$="AFGAF15EGF15F"
2320 PLAY"T2"
2330 PLAY"XS$;XB$;XS$;XC$;XS$;XB$;XD$;XE$;"
2340 GOTO2140
2350 REM***INSTRUCTIONS***
2360 CLS0:PRINT:SOUND100,1:PRINT"YOUR BASE SHIP IS IN
DESPERATE":SOUND100,1
2370 PRINT"NEED OF REPAIR. YOU MISSION IS":SOUND100,1
2380 PRINT"TO OBTAIN SIX PARTS FROM THE":SOUND100,1
2390 PRINT"HUMANS WHO ARE SENDING THEM TO ":SOUND100,1
2400 PRINT"THEIR OWN SPACE STATION. YOU":SOUND100,1
2410 PRINT"MUST AVOID THE SHIELDS THAT ARE":SOUND100,1
2420 PRINT"CONTINUALY OPENING AND CLOSING":SOUND100,1
2430 PRINT"OVER THE VITAL PARTS YOU REQUIRE":SOUND100,
1
2440 GOSUB 2670
2450 CLS0:PRINT:PRINT"YOU HAVE 4 SHIPS IN WHICH TO":SO
UND100,1
2460 PRINT"TRY AND COMPLETE YOUR TASK.":SOUND100,1
2470 PRINT"REMEMBER-GRAVITY WILL ALWAYS":SOUND100,1
2480 PRINT"PULL YOU DOWN. IF YOU HIT THE ":SOUND100,1
2490 PRINT"SURFACE OR THE SHIELDS YOU WILL":SOUND100,1
2500 PRINT"LOSE 1 OF YOUR SHIPS.":SOUND100,1
2510 PRINT"DUE TO THE SIZE OF YOUR CRAFT":SOUND100,1
2520 PRINT"YOU CAN ONLY CARRY 1 LOAD PER":SOUND100,1
2530 PRINT"TRIP.AFTER YOU OBTAIN 1 OF THE":SOUND100,1
2540 PRINT"PARTS YOU MUST RETURN IT TO THE":SOUND100,1
2550 PRINT"MOTHER SHIP.A NOTE WILL TELL ":SOUND100,1
2560 PRINT"YOU,IF YOU ARE SUCCESSFUL.":SOUND100,1
2570 PRINT:SOUND100,1
2580 GOSUB 2670
2590 CLS0:PRINT@10," CONTROLS. ";
2600 PRINT@128," <-LEFT ";
2610 PRINT@151," RIGHT-> ";
2620 PRINT@172," ^ UP ";
2630 PRINT@299," S=STOP ";
2640 PRINT@393," C=CONTINUE ";
2650 GOSUB 2670
2660 RETURN
2670 FOR T=1 TO 200:NEXT T
2680 PRINT@486,"PRESS THE SPACEBAR";
2690 IF PEEK(345)<>223 THEN 2690
2700 RETURN
2710 REM***PAUSE***
2720 IF PEEK(341)<>251 THEN 2720
2730 SOUND200,3:SOUND100,2
2740 RETURN
```

Four in a row

Martin Roberts,
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West Yorkshire.



FOUR IN A ROW is exactly the same as the popular Connect Four game. The game can be played either against the computer or against another human being. The rules are very simple.

The game is played — in this case — on a 9 by 8 board. The player makes his move by dropping coloured disks down the board. The disk always falls to the bottom of each column. The next player then makes his move by dropping a different coloured disk.

The winner is the player who gets four of his disks in a row. The row can be either horizontal, vertical or diagonal. In computer play mode, the user is asked which level of difficulty he would like to play at. The levels are from 1 to 5. In level 1 the computer will only play defensively and so does not play a very good game. In level 5 however the computer will provide a challenge to most players. The speed of play varies with difficulty. The computer can take up to 40 seconds to make a move in difficulty factor 5.

A detailed description of the workings of the program would be beyond the scope of this article but there is a brief description of what each section of the program does.

Lines	Operation
30 to 70	initialisation of variables and characters.
160 to 200	instructions.
310 to 390	initialisation of arrays.
460 to 550	main loop of program.
610 to 720	check for win.
890 to 900	program data.
920 to 1970	computer move section.

Briefly the computer move making section operates as follows. The computer scans each column from left to right and calculates the numbers of disks in a straight line which would result in going in that column. Different values are assigned to each number in the row. So two in a row might be worth 10 points whereas three in a row might be worth 30 points — four in a row is of course given the maximum of 13000 points as this wins the game.

Things do not stop there though, the computer must then calculate the values for stopping the opponent from going in that particular column. This is done in the same way but these values are negative since they are defensive.

But what about the position above? This must also be considered or there would be danger of letting the opponent in i.e. there would be no point in going in a column which lead to three in a row if the position above lead to your opponent getting his four in a row. So the position above is also examined in the way previously described.

When the computer has finished calculating the values it then simply scans all the columns to find the one with the highest value. This is the computers move. Readers may like to experiment with the computers play by changing the data in lines 890-900.

```
10*KEY10OLD|MRUN|M
20ONERROR RUN
30MODE7:DIMA%(9,10),H%(8),AD%(8),B%(3,1),C%(2,1,3),
D%(1,1,1),E%(1),V%(8),F%(1,1):Q2%=0:GG=0:CM%=0:DO%=4:O
%=4:Q1%=0:PA%=0:C=0:HH%=1:EG%=0:FG%=0:*FX4,1
40VDU23,241,255,254,254,252,252,248,248,240,23,240,
255,127,127,63,63,31,31,15,23,242,15,7,7,3,3,1,1,0,23,
243,240,224,224,192,192,128,128,0
50FF%=1:CP%=1:Y$="Green":B$="Pink"
60VDU23,244,1,3,15,31,63,63,127,127,23,245,128,192,
224,240,252,252,254,254,23,246,127,127,255,255,255,255
,127,127
70VDU23,247,254,254,255,255,255,255,254,254,23,248,
127,127,63,63,31,15,3,1,23,249,254,254,252,252,240,224
,192,128
80PRINT:PRINTSPC(12)CHR$(141)CHR$(134)"FOUR IN A RO
W":PRINTSPC(12)CHR$(141)CHR$(133)"FOUR IN A ROW":FORX=
1TO28:PRINTCHR$(131)"*";:NEXT:FORX=4TO28:PRINTTAB(0,X)
CHR$(131)"*"
90PRINTTAB(38,X)CHR$(131)"*":NEXT:PRINTTAB(0,28)"";
FORX=1TO28:PRINTCHR$(131)"*";:NEXT:VDU28,2,28,38,4
100PRINTTAB(10,4)"BY MARTIN ROBERTS":PRINTTAB(12,8)"
COPYRIGHT 1984"
110PRINTTAB(6,14)"Do you want instructions";
120A$=GET$:IFA$="N"THEN140
130IFA$<>"Y"ANDA$<>"N"THENPRINTTAB(6,14)SPC(8)"Y/N P
lease"SPC(6):PROCDELAY:GOTO110
140CLS
150IFA$="N"THEN220
160PRINT:PRINT" This two player game consists of
stacking coloured discs in a 9 by 8 grid.":PRINT
170PRINT" The object of the game is for you    to ge
t four of your discs in a row,  vertically, horizontal
ly or,          diagonally."
180PRINT:PRINT" The cursor is moved by pressing the
left and right arrow keys and a      move is made by
pressing the         downward arrow key."
190PRINT:PRINT" Press any key to continue";:A$=GET$:
CLS
200PRINT:PRINT" In two player mode, a move may be
retracted by pressing the upward     arrow key."
210PRINT:PRINT" Press any key to continue";:A$=GET$:
CLS
220PRINTTAB(6,1)"Are you using a colour":PRINTTAB(12
,3)"television?";:A$=GET$:PRINTA$:IFA$<>"N"ANDA$<>"Y"T
HENCLS:PRINTTAB(11,1)"(Y/N) Please":PROCDELAY:GOTO220
230IFA$="N"THENB$="White":Y$="Grey":Q%=1
240PRINTTAB(10,5)"(1=";B$;",2=";Y$;")":PRINTTAB(7,7)
"First players colour?";:A$=GET$:NB%=VAL(A$):PRINTA$:I
FNB%<>1ANDNB%<>2THENPRINTTAB(7,7)"    1 or 2 please
":PROCDELAY:GOTO240
250KB%=1:F$=Y$:S$=B$:IFNB%=1THENF$=B$:S$=Y$:KB%=2
260PRINTTAB(1,9)"Do you want to play the computer?";
:A$=GET$:PRINTA$:PRINT:IFA$<>"N"ANDA$<>"Y"THENPRINTTAB
(1,9)SPC(10)"(Y/N) please"SPC(12):PROCDELAY:GOTO260
270IFA$="N"THENPRINT:PRINTSPC(6)"Press any key to be
gin -";:A$=GET$:GOTO310
280PRINTTAB(6,11)"Do you want to go first?";:A$=GET$
:PRINTA$:IFA$<>"N"ANDA$<>"Y"THENPRINTTAB(1,11)SPC(10)"
(Y/N) please"SPC(11):PROCDELAY:GOTO280
290I%=1:IFA$="Y"THENCP%=2:I%=0
300PRINT:PRINTTAB(5,13)"Type difficuty factor (1-5)"
;:DF$=GET$:DF%=VAL(DF$):PRINTDF$:CM%=1:IFDF%>5ORDF%<1T
HENPRINTTAB(5,13)SPC(3)"Between 1 and 5 please"SPC(11)
:PROCDELAY:GOTO300
310RESTORE:FORR%=0TO9:FORJ%=0TO10:A%(R%,J%)=0:NEXT:N
EXT:FORR%=0TO8:AD%(R%)=0:H%(R%)=0:NEXT:LF%=0
320FORI%=0TO10:A%(9,I%)=3:A%(0,I%)=3:NEXT
330FORI%=0TO9:A%(I%,0)=3:A%(I%,10)=3:NEXT
340FORI%=0TO3:READB%(I%,0):READB%(I%,1):NEXT
350FORI%=0TO1:FORJ%=0TO1:FORK%=0TO3:READC%(I%,J%,K%)
:NEXT:NEXT:NEXT
360FORI%=0TO1:FORJ%=0TO1:FORK%=0TO1:READD%(I%,J%,K%)
:NEXT:NEXT:NEXT
370READE%(0),E%(1)
380READF%(0,0),F%(1,0),F%(0,1),F%(1,1)
390IFFF%=1THENFF%=2 ELSEFF%=1
400MODE5:VDU19,3,4,0,0,0,19,2,2,0,0,0,19,1,5,0,0,0,2
3;8202;0;0;0;
410IFY$="Grey"THENVDU19,1,7,0,0,0
420VDU28,0,28,19,2:COLOUR131:CLS:COLOUR0
430FORX=1TO17STEP2:FORY=2TO23STEP3:PROCDISK:NEXT:NEX
T
440Y=0:FORX=1TO18STEP2:PROCPOINTER:NEXT:N%=0
450X%=FF%:X=OO%*2+1:GOTO530
460IFCM%=1ANDCP%=X%THEN920
470A$=INKEY$(0):IFASC(A$)=137THENO%=O%+1:IFO%=9THENO
%=0
480IFASC(A$)=139ANDHH%=0ANDCM%=0THENA%(H%(E%),E%+1)=
0:H%(E%)=H%(E%)-1:X=E%*2+1:FORY=23-H%(E%)*3TO2STEP-3:P
ROCC:PROCDISK:COLOUR0:PROCDISK:SOUND1,-10,Y*30,1:NEXT:
HH%=1:LF%=LF%-1:O%=E%:PROCC1
490IFASC(A$)=136THENO%=O%-1:IFO%=-1THENO%=8
500IFASC(A$)=138ANDH%(O%)<8THENE%=O%:GOSUB560:OO%=O%
:HH%=0:GOTO530
510IFO%<>OO%THENCOLOUR0:X=OO%*2+1:PROCPOINTER:X=O%*2
+1:COLOURHC%:PROCPOINTER:OO%=O%
520GOTO460
530IFX%=1THENCOLOURKB%:HC%=KB%:X%=2 ELSECOLOURNB%:HC
%=NB%:X%=1
540PROCPOINTER
550GOTO460
560H%(O%)=H%(O%)+1
570A%(H%(O%),O%+1)=X%:X=O%*2+1:FORY=2TO26-H%(O%)*3ST
EP3:COLOURHC%:PROCDISK:COLOUR0:PROCDISK:NEXT:COLOURHC%
:Y=26-H%(O%)*3:PROCDISK
580SOUND1,-15,H%(O%)*30,2:Y=0
590FORY=1TO1000:NEXT
600*FX21,0
610Q1%=0
620W%=1:V%=0
630P%=A%(H%(O%)+B%(Q%,1)*K%,(O%+1)+B%(Q%,0)*K%)
640IFP%<>X%THEN670
```

(continued on page 172)

(continued from page 170)

```
  650IFK%>0THENK%=K%+1:GOTO630
  660K%=K%-1:GOTO630
  670IFK%>0THENML%=K%:TP%=K%-1:K%=-1:GOTO630
  680VL%=VL%-K%
  690IFVL%>4THEN730
  700Q%=Q%+1:IFQ%<4THEN620
  710LF%=LF%+1:IFLF%=72THENMODE7:PRINTTAB(0,0)"The gam
e is drawn":GOTO850
  720RETURN
  730FORY%=1TO110STEP20:SOUND1,-15,Y%,Y%/20+2:NEXT:FOR
Y%=110TO1STEP-20:SOUND1,-15,Y%,7-Y%/20+2:NEXT:E%=0
  740R%=K%+1
  750IFE%=0THENCOLOUR0:GOTO770
  760COLOURHC%
  770X=1+(O%+B%(Q%,0)*R%)*2:Y=26-(H%(Q%)+B%(Q%,1)*R%)*
3:PROCDISK
  780FORI=1TO200:NEXT
  790IFINKEY(0)<>-1THEN830
  800R%=R%+1:IFR%<TP%+1THEN750
  810IFE%=0THENE%=1:GOTO740
  820E%=0:GOTO740
  830MODE7:IFX%=1THENFS%=FS%+1:W$=F$ ELSEW$=S$:SS%=SS%
+1
  840PRINTTAB(1,6)W$" Wins":PRINT:PRINT"The score is "
F$"="STR$(FS%)","S$"="STR$(SS%):PRINT
  850GG=1:PRINTTAB(0,10)"Would you like another go?";:
A$=GET$:IFA$<>"Y"ANDA$<>"N"THENPRINTTAB(0,10)SPC(0)"Y/
N Please"SPC(8):PROCDELAY:GOTO850
  860IFA$="Y"THEN310
  870MODE7:END
  880DATA1,-1,1,1,0,-1,1,0
  890DATA10,12,30,35,5,6,20,25
  900DATA29,33,20,31,125,1625,175,2125,625,625,13000,6
000,-7000,-6000
  910DEFPROCDELAY:SOUND1,-15,50,10:FORX=1TO1000:NEXT:E
NDPROC
  920D0%=0:HV%=-30000
  930IFLF%=0THENHP%=INT(RND(1)*2)+4:GOTO1900
  940PS%=0:C2%=1:W%=2
  950IFX%=2THENC2%=2:W%=1
  960FORI%=0TO8:V%(I%)=0:NEXT
  970FORI%=0TO8:H%=H%(I%)+1
  980IFDF%<2THEN1000
  990PR%=0:PA%=0:C%=W%:C3%=C2%:GOSUB1150
 1000PR%=1:C%=C2%:C3%=W%:GOSUB1150
 1010IFDF%<2THEN1060
 1020H%=H%+1:PA%=1
 1030IFH%>6ORDF%<3THEN1060
 1040GOSUB1150
 1050PR%=0:C%=W%:C3%=C2%:GOSUB1150
 1060NEXTI%
 1070FORI%=0TO8:V%(I%)=V%(I%)+AD%(I%):NEXT
 1080FORI%=0TO8
 1090IFHV%=V%(I%)ANDRND(1)>.5THENHP%=I%
 1100IFHV%<V%(I%)THENHV%=V%(I%):HP%=I%
 1110NEXTI%
 1120IFD0%=1ANDHP%=PS%THENAD%(TY%)=625:D0%=0
 1130GOTO1980
 1140REMFINDVAL
 1150IFA%(H%,I%+1)=3THENV%(I%)=-30000:RETURN
 1160FORJ%=0TO3
 1170A%=B%(J%,1):B%=B%(J%,0)
 1180K%=0:D%=0:N%=1:BL%=0
 1190P%=A%(H%+A%*K%,I%+1+B%*K%)
 1200D%=D%+1
 1210IFP%=3ORP%=C%THEND%=D%-1:GOTO1960
 1220IFP%=C3%THENN%=N%+1
 1230IFN%=4THEN1920
 1240IFD%=4THEN1280
 1250IFK%>-1THENK%=K%+1:GOTO1190
 1260K%=K%-1:GOTO1190
 1270REMNO BOUNDRY
 1280M1%=0:M2%=0:CT%=0:R%=0
 1290IFN%>3THEN1920
 1300IFDF%<4THEN1620
 1310IFK%=3THENM%=0:BF%=3:GOTO1330
 1320M%=M%-3:R%=M%
 1330M%=M%-1:CT%=CT%+1:IFCT%>BF%THEN1430
 1340Q%=A%(H%+A%*M%,I%+1+B%*M%)
 1350P%=A%(H%+A%*(M%+4),I%+1+B%*(M%+4))
 1360IFQ%=3ORQ%=C THEN1430
 1370IFQ%=C3%ANDP%=0THEN1400
 1380IFQ%=0ANDP%=C3%THENM1%=M1%-1
 1390GOTO1330
 1400M1%=M1%+1
 1410IFM1%>M2%THENM2%=M1%:R%=M%
 1420GOTO1330
 1430N%=N%+M2%:IFN%<2THEN1640
 1440IFN%>3THEN1920
 1450FG%=0:H1%=H%:N7%=0:FORK%=R%TOR%+3:IFA%(H%+A%*K%,I
%+1+B%*K%)=0THENPROCU:IFN1%>N7%THENN7%=N1%
 1460IFA%(H%-1+A%*K%,I%+1+B%*K%)<>0THENBL%=1
 1470NEXT:IFN7%>3THENFG%=1
 1480S%=0:T%=0:K%=1:M%=1:DP%=0:BF%=1
 1490P%=A%(H%+A%*K%,I%+1+B%*K%)
 1500IFP%=0THEN1550
 1510IFP%=C%ORP%=3THENBF%=0:GOTO1550
 1520M%=M%+1
 1530IFK%>0THENK%=K%+1:GOTO1490
 1540K%=K%-1:GOTO1490
 1550IFK%>0THENS%=K%:K%=-1:GOTO1490
 1560T%=K%:IFBF%=0ANDFG%=1THEN1640
 1570IFN%<>M%ORBF%=0THEN1610
 1580IFA%(H%-1+A%*S%,I%+1+B%*S%)<>0ANDA%(H%-1+A%*T%,I%
+1+B%*T%)<>0THENDP%=1
 1590IFPA%=1THENV%(I%)=V%(I%)-D%(N%-2,PR%,DP%):GOTO161
0
 1600V%(I%)=V%(I%)+D%(N%-2,PR%,DP%)
 1610IFN%=3THEN1820
 1620IFN%<2THEN1640
 1630IFPA%=1THENV%(I%)=V%(I%)-C%(BL%,N%-2,PR%) ELSEV%(
I%)=V%(I%)+C%(BL%,N%-2,PR%)
 1640NEXTJ%:RETURN
 1650DEFPROCU:N1%=0:L%=0
 1660M%=0:L3%=0
 1670P%=A%(H1%+K%*A%+B%(L%,1)*M%,I%+1+B%*K%+B%(L%,0)*M
%)
 1680IFP%<>0ANDM%=0THENENDPROC
 1690IFM%=0THEN1710
 1700IFP%<>C3%THEN1740
 1710L3%=L3%+1
 1720IFM%>-1THENM%=M%+1:GOTO1670
 1730M%=M%-1:GOTO1670
 1740IFM%>-1THENM%=-1:GOTO1670
 1750IFN1%<L3%THENN1%=L3%
 1760L%=L%+1:IFL%<4THEN1660
 1770IFN1%>3THENDP%=1:ENDPROC
 1780DP%=0:ENDPROC
 1790DEFPROCT:H1%=H%+1:PROCU
 1800IFDP%=1THENENDPROC
 1810H1%=H%-1:PROCU:ENDPROC
 1820DP%=0
 1830IFDF%<5THEN1640
 1840A%(H%,I%+1)=C3%
 1850IFA%(H%+A%*S%,I%+1+B%*S%)=0THENK%=S%:PROCT:IFDP%=
1THENG%=K%:GOTO1880
 1860IFA%(H%+A%*T%,I%+1+B%*T%)=0THENK%=T%:PROCT:IFDP%=
1THENG%=K%:GOTO1880
 1870A%(H%,I%+1)=0:GOTO1630
 1880IFPA%=0THENV%(I%)=V%(I%)+E%(PR%):GOTO1900
 1890V%(I%)=V%(I%)-E%(PR%)*.7
 1900A%(H%,I%+1)=0:PS%=I%:TY%=I%+B%*G%:IFPA%=0ANDPR%=0
THEND0%=1
 1910GOTO1640
 1920V%(I%)=V%(I%)+F%(PR%,PA%)
 1930IFPA%=0ANDPR%=0THENI%=8
 1940GOTO1640
 1950REM HIT
 1960IFK%>-1THENM%=K%-1:BF%=M%:K%=-1:GOTO1190
 1970GOTO1640
 1980J%=-1
 1990IFHP%>O%THENJ%=1
 2000FORI%=O%TOHP%STEPJ%
 2010X=I%*2+1:PROCPOINTER
 2020COLOUR0
 2030FORY=1TO100:NEXT
 2040X=I%*2+1:PROCPOINTER
 2050COLOURHC%
 2060NEXT
 2070X=(I%-J%)*2+1:PROCPOINTER
 2080O%=HP%:GOSUB560:GOTO530
 2090DEFPROCPOINTER:PRINTTAB(X,0)CHR$(240)CHR$(241):PR
INTTAB(X,1)CHR$(242)CHR$(243):ENDPROC
 2100DEFPROCDISK:PRINTTAB(X,Y)CHR$(244)CHR$(245):PRINT
TAB(X,Y+1)CHR$(246)CHR$(247):PRINTTAB(X,Y+2)CHR$(248)C
HR$(249):ENDPROC
 2110DEFPROCC:IFX%=1THENCOLOURK0% ELSECOLOURN0%
 2120ENDPROC
 2130DEFPROCC1:IFX%=1THENCOLOURK0%:HC%=K0%:X%=2 ELSECO
LOURN0%:HC%=N0%:X%=1
 2140X=O%*2+1:COLOURHC%:PROCPOINTER
 2150ENDPROC
>D
```

VDU 19

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THESE MACHINE-CODED routines are designed to emulate the VDU 19 command found on BBC and Electron computers. The first routine performs a universal ink change without disturbing the text already on the screen. It will not search for and replace any colour but it will change all the text to blue, for example.

The second routine is similar to the first but changes the paper colour instead of the ink, again this routine leaves any text unchanged. After this comes the third routine, this is more complex than the previous two. It searches through the text and if it finds a certain colour it will change it to another, again this leaves all text unchanged.

Finally comes the fourth routine which searches through paper colours and if it finds a specific colour it changes it.

Now you know exactly what each routine does you must type them in. First type in and run the program provided. This will ask you for the address you want the machine code to start from, on a 16K machine 30000 is a good origin and 60000 on a 48K machine. When this address has been entered ten more addresses will be displayed, the meanings of which are given here:

Address 1: Poke this with the new ink colour.
Address 2: Randomize USR for routine one.
Address 3: Poke this with the new paper colour.
Address 4: Randomize USR for routine two.
Address 5: Ink colour to search for.
Address 6: New ink colour.
Address 7: Randomize USR for routine three.
Address 8: Paper colour to search for.
Address 9: New paper colour.
Address 10: Randomize USR for routine four.
Addresses 1 and 2 refer to routine one.
Addresses 3 and 4 refer to routine two.
Addresses 5, 6 and 7 refer to routine three.
Addresses 8, 9 and 10 refer to routine four.

After printing these addresses the program will proceed to poke the machine code and after a few seconds you will either see the message "code O.K. . . ." in which case you can save and verify the code or the message, or "Check sum error; check data" which means that you have mis-typed one or more of the numbers and the program will stop allowing you to check and rectify the data. When you are satisfied the data is correct, re-run the program.

The basic programme will then re-new itself, you can then type:

CLEAR ST — 1

where ST is the origin. And then type Load"" Code and load back the machine code in memory, then you are free to use the routines.

```
10 REM ** M/C Loader **
20 REM **A.Daines '84**
30 INPUT"Enter Origin ";ST
40 DIM A(10)
50 LET A(1)=ST
60 LET A(2)=ST+1
70 LET A(3)=ST+25
80 LET A(4)=ST+26
90 LET A(5)=ST+60
100 LET A(6)=ST+61
110 LET A(7)=ST+62
120 LET A(8)=ST+96
130 LET A(9)=ST+97
140 LET A(10)=ST+98
150 FOR N=1 TO 10:PRINT AT N,1;"Address ";N;"=";A(N):NEXT N
160 PRINT''"Write down these addresses"
170 LET TOT=0
180 FOR N=ST TO ST+152
190 READ B:POKE N,B:LET TOT=TOT+B
200 NEXT N
210 IF TOT<>16085 THEN PRINT AT 20,0;"Checksum Error:Check Data":STOP
220 PRINT AT 15,0;"Code O.K......"
230 PRINT'"Prepare to save....."
240 SAVE "VDU 19" CODE ST,152
250 PRINT'"Verify....."
260 VERIFY "" CODE
270 PRINT'"Verified O.K."
280 PAUSE 0
290 NEW
300 DATA 0,33,0,88,17,192,2,126,230,248,71,58,96,234,128,119,35,27,122,179,32,24
1,201,0,0,0
310 DATA 58,121,234,23,23,23,230,56,50,121,234,33,0,88,17,192,2,126,230,199,71,5
8,121,234,128,119
320 DATA 35,27,122,179,32,241,201,0,0,0,33,0,88,17,192,2,58,156,234,71,126,230,7
,184,32,9
330 DATA 58,157,234,71,126,230,248,128,119,35,27,122,179,32,231,201,0,0,0,0,58,1
92,234,23,23,23
340 DATA 230,56,50,192,234,58,193,234,23,23,23,230,56,50,193,234,33,0,88,17,192,
2,58,192,234,71
350 DATA 126,230,56,184,32,9,58,193,234,71,126,230,199,128,119,35,27,122,179,32,
231,201
```

Shape, draw and fill

Carl Ellis,
Swindon,
Wiltshire.



THE AMSTRAD CPC-464 has some excellent facilities for graphics — with a resolution of 640 by 200 pixels in Mode 2. Although the excellent Basic includes a comprehensive suite of graphics commands there are one or two useful commands that are not present in Amstrad BASIC — a circle drawing command and a command for colouring large areas of screen.

The Circles program draws the outline of a circle with a radius of 100 pixels and with its centre in the middle of the screen. To change this, alter variables r — the radius — ,x and y — the centre.

The second program — concentric circles — draws two circles — both with the same centre. One has a radius of 100 pixels and the other a radius of 50 pixels. The variables used are r and r2 — radii of circles — ,x and y — centre of circles.

It is also possible to draw solid — coloured in — circles on the CPC-464. All we need to do is to draw lines across the circle.

The Solid Circles program draws a coloured-in circle with a radius of 50 pixels in the centre of the screen — see variables s,x and y. The program draws a line in the top half of the circle which is then reflected in the bottom half.

Run the solid circles program again and type:
INK 1,1
The circle — and the cursor — has now disappeared! To get them back again type:
INK 1,24
Make the following alterations to the solid circles program:

```
25 INK 1,1
40 IF s=0 THEN INK 1,24:END
70 IF s=0 THEN INK 1,24:END
```

In Mode 1, up to 4 Inks are available, after switching-on or resetting the CPC-464 defaults to Mode 1. Ink 0 is the background — paper — and Ink 1 is the foreground — pen — you could change this though. The circle "disappeared" because it was the same colour as the background. Inks can be used to create the effect of animation.

It is also possible to draw ovals on the CPC-464. The program is similar to that for drawing circles, after all, an ellipse is only an elongated circle.

The oval is twice as high — 100 pixels — as it is wide (50 pixels). To change this, alter the variable r in line 40 and the number of r's in line 70.

Ink-swap circles demonstrates the use of filling-in circles and Inks. I have used Mode 0 because it offers most Inks (16) although it has a fairly low resolution of 160 by 200 pixels. A circle is drawn at a random position on the screen and with a random radius. Then the Border and Inks are changed and another circle is drawn.

This is done repeatedly to create a pleasing effect. To change the maximum radius of the circle alter variable R in line 40. "Ink-swap circles" is a "sit and watch" program.

Program 1.

```
10 REM Circles
20 MODE 1:CLS:CLG
30 r=100:x=320:y=200
40 DEG
50 ORIGIN x,y
60 FOR a=1 TO 360
70 PLOT r*COS(a),r*SIN(a)
80 NEXT a
```

Program 2.

```
10 REM Concentric circles
20 MODE 1:CLS:CLG
30 r=100:r2=50:x=320:y=200
40 DEG
50 ORIGIN x,y
60 FOR a=1 TO 360
70 PLOT r*COS(a),r*SIN(a)
80 PLOT r2*COS(a),r2*SIN(a)
90 NEXT a
```

Program 3.

```
10 REM Solid Circles
20 MODE 1:CLS:CLG
30 x=320:y=200:s=50
40 IF s=0 THEN END
50 r=s*s
60 s=s-1
70 IF s=0 THEN END
80 z=SQR(r-s*s)
90 l=z+z
100 sl=x-z
110 IF sl<0 THEN l=l+sl:sl=0
120 PLOT sl,y+s:DRAWR l,0
130 IF y-s<0 GOTO 60
140 PLOT sl,y-s:DRAWR l,0
150 GOTO 60
```

Program 4.

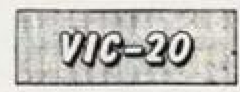
```
10 REM Ovals
20 MODE 1:CLS:CLG
30 DEG
40 x=320:y=200:r=50
50 ORIGIN x,y
60 FOR a=1 TO 360
70 PLOT r*COS(a),r*2*SIN(a)
80 NEXT a
```

Program 5.

```
10 REM Ink-Swap Circles
20 MODE 0:CLS:CLG
30 FOR n=1 TO 15:INK n,INT(RND*27):NEXT n
40 x=INT(RND*639):y=INT(RND*399):r=INT(RND*80)
50 ci=INT(RND*15)
60 BORDER INT(RND*27)
70 IF r=0 THEN 30
80 s=r*r
90 r=r-1
100 IF r=0 THEN 30
110 z=SQR(s-r*r)
120 l=z+z
130 sl=x-z
140 IF sl<0 THEN l=l+sl:sl=0
150 PLOT sl,y+r,ci:DRAWR l,o,ci
160 IF y-r<0 THEN 90
170 PLOT sl,y-r,ci:DRAWR l,o,ci
180 GOTO 90
```

MC Mover

P J Mew,
West Molesey,
Surrey.



HAVE YOU NOTICED that all those useful machine-code routines published in magazines are always located at the top of unexpanded Vic-20 memory. This is extremely inconvenient if you want to have, more than one routine in memory at a time.

Here is a Basic program to help you move "un-relocatable" machine-code routines around in memory. It occupies just over 2K and with very little alteration will also work on the Commodore 64.

The program will recompute all "JSR" "JMP" and absolute instructions to addresses within the subroutine and move the machine code anywhere in user Ram. Be sure to protect the new area of memory before loading any other programs.

The program was written only as an aid and should be used with care. For example numbers loaded via the accumulator into the zero page for subsequent use as an indirect address back into the subroutine will not be altered by the program and will still have to be changed by hand. Any text or data contained within the machine code may also cause confusion and the best way to handle this is to poke data or text bytes to zero before moving the code, then poking back the correct values in the new memory locations.

The program works by first setting up three arrays containing all valid 6502 op codes, with zero, one and two byte operands in separate arrays.

The user is then asked to input the old start address, old end address of the code to be moved and the new start address it is to be moved to.

The program then compares the first byte to be moved with the list of op codes until it finds a match, if the op code has no operands

(continued on next page)

(continued from previous page)

or one operand, the code is transferred directly by the for next loop in line 390.

If the op code has a two byte operand, the address the instruction points to is compared with the start and end addresses of the code being moved and if it is in range the address is recomputed before being moved. All other instructions are moved without alteration.

Once the code has been moved it can easily be turned back into data statements using the program "self writing" published in *Your Computer* in October 1983. Because it is written in basic the program is not very fast, in fact if you are considering moving more than about 1K you might as well go and do the shopping while the conversion is done. However, it does work and is still quicker than recomputing jumps by hand.

Vic machine-code mover.

```
10 POKE36879,25:PRINT"█"
20 DIMS(31),D(75),T(50)
30 F=0
40 I=0
50 READS:S(I)=S:IFS=-1THEN70
60 I=I+1:GOTO50
70 I=0
80 READD:D(I)=D:IFD=-2THEN100
90 I=I+1:GOTO80
100 I=0
110 READT:T(I)=T:IFT=-3THEN130
120 I=I+1:GOTO110
130 PRINT"█"
140 POKE19,1
150 INPUT"█OLD START ADD-  ";OS$:PRINTCHR$(13):OS=VAL(OS$)
160 INPUT"█OLD END ADD-    ";OE$:PRINTCHR$(13):OE=VAL(OE$)
170 INPUT"█NEW START ADD-  ";NS$:NS=VAL(NS$)
180 POKE19,0
190 IFNS>65536OROS>65536OROE>65536THEN130
200 IFOE<OSTHEN550
210 IFNS=>OSANDNS=<OETHEN590
220 I=0:OP=0
230 PRINT"██████ █ THE MACHINE CODE      █INSTRUCTION AT         █ADDRESS-"
240 PRINT"█  IS BEING RELOCATED"
250 PRINT"█████████████████████"OS+I"█":A=0:OB=PEEK(OS+I)
260 IFS(A)=OBTHENOP=1:GOTO390
270 IFS(A)=-4THEN290
280 A=A+1:GOTO260
290 A=0
300 IFD(A)=OBTHENOP=2:GOTO390
310 IFD(A)=-4THEN330
320 A=A+1:GOTO300
330 A=0
340 IFT(A)=OBTHENOP=3:GOTO380
350 IFT(A)=-4THEN370
360 A=A+1:GOTO340
370 OP=1:GOTO390
380 IFOP=3THEN430
390 FORQ=0TOOP:POKENS+I+Q,PEEK(OS+I+Q):NEXT
400 I=I+OP
410 IFOS+I=>OETHEN520
420 GOTO250
430 X=256*PEEK(OS+I+2)+PEEK(OS+I+1)
440 IFX=>OSANDX<OETHEN460
450 GOTO390
460 Y=X-OS
470 Z=NS+Y
480 V=INT(Z/256)
490 W=Z-V*256
500 POKENS+I+1,W:POKENS+I+2,V:POKENS+I,OB
510 I=I+OP:F=F+1:GOTO250
520 PRINT"█████████"FTAB(6)"ADDRESSES HAVE        █ BEEN RENUMBERED"
530 PRINT"███  PROGRAM FINISHED"
540 END
550 PRINT"███████START ADDRESS MUST BE █LESS THAN END ADDRESS"
560 PRINT"█████████████HIT ANY KEY██"
570 GETA$:IFA$=""THEN570
580 GOTO130
590 PRINT"██████ YOU CANNOT RELOCATE  █NEW CODE INTO THE AREA   █ALREADY OCCUPIE
D"
600 PRINT"█   BY THE OLD CODE"
610 PRINT"███████████HIT ANY KEY██"
620 GETA$:IFA$=""THEN620
630 GOTO130
640 DATA170,138,154,186,168,152,232,202,200,136,
650 DATA24,56,216,248,184,88,120
660 DATA0,96,64
670 DATA10,74,42,106,72,104,8,40,234,-4,-1
680 DATA169,165,181,161,177,133,149,129,145
690 DATA105,101,117,97,113,233,229,245,225,241
700 DATA201,197,213,193,209,41,37,53,33,49
710 DATA9,5,21,1,17,73,69,85,65,81
720 DATA162,166,182,136,150,160,164,180,132,148
730 DATA224,228,192,196,208,240,16,144,48,80,112,176
740 DATA6,2,70,86,38,54,102,118,230,246,198,214,36,-4,-2
750 DATA173,189,185,141,157,153,109,126,121,237,253,249
760 DATA205,221,217,45,61,57,13,29,25,77,93,89
770 DATA174,190,142,172,188,140,236,204,76,108,32
780 DATA14,30,78,94,46,62,110,126,238,254,206,222,44,-4,-3
```

Program Loader

Colin McShane,
Coatbridge,
Lanarkshire.

ORIC

THIS PROGRAM will display the contents of a personal cassette. It also allows the selection of the contents of the cassette. New files of programs can be added to the utility program itself.

By moving the cursor up to the appropriate line number where the arrays A$(1-10) display the program names, copy the whole line using Ctrl-A and type in the new program name. When you have finished typing in the program name, press return and continue to add other program names.

If you have finished entering new files then re-Run the program. Leave some space on the tape after saving the Program Loader. This is due to extra memory space being required by the program when new files are added.

Up to 10 program files can be utilised but with a few modifications, extra files can be added. Prompts throughout the program will guide you through the loading and saving procedures.

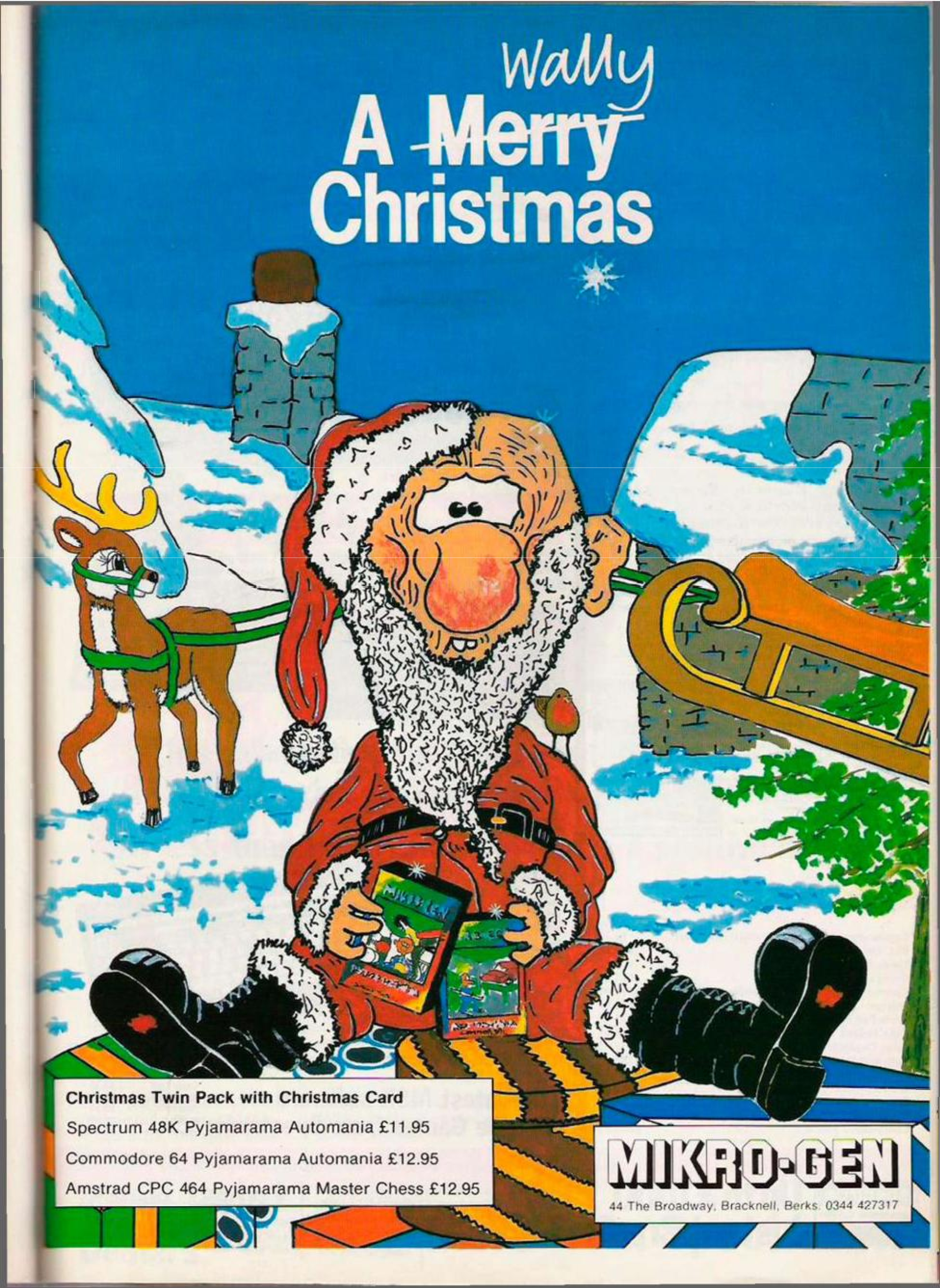
Program rundown.

Lines

1—4 : Initialisation and screen set-up.
30—50 : Program selection screen.
60: Load routine
100—145 : Program name filespace.
150—170 : Extra filespace.
1000— : Editing files routine.

Oric program loader.

```
1 DIM A$(10):CLS:POKE#26A,10
2 PLOT4,3,CHR$(1)+CHR$(10)+"PROGRAM LOADER"
3 PLOT4,4,CHR$(1)+CHR$(10)+"PROGRAM LOADER"
4 PLOT6,6,"TAPE-*1*......DEMONSTRATION"
8 GOSUB 100
9 A1$="NEW PROGRAM (Y/N) ?"
10 WAIT175
20 PLOT6,10,A1$
25 GET X$:IF X$="Y"THEN 1000 ELSE 30
30 CLS
35 FOR X=1 TO 10
40 PRINT:PRINTX;A$(X)
45 NEXT X
50 PLOT11,22,CHR$(12)+"CHOOSE PROGRAM":GET X
60 CLOAD A$(X)
100 A$(1)="EXAMPLE-1"
105 A$(2)="EXAMPLE-2"
110 A$(3)="EXAMPLE-3"
115 A$(4)="EXAMPLE-4"
120 A$(5)="EXAMPLE-5"
125 A$(6)="...................."
130 A$(7)="...................."
135 A$(8)="...................."
140 A$(9)="...................."
145 A$(10)="...................."
150 REM
160 REM
170 REM
180 RETURN
1000 CLS:PRINT:PRINT"ENTER NEW PROGRAM
     NAME":PRINT
1005 LIST100-145
```


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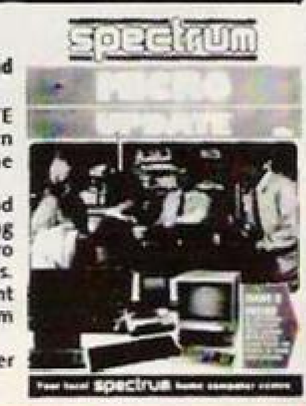
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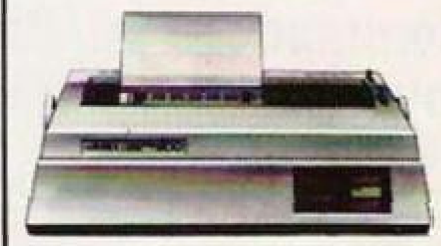
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These stylish new personal computers are among the best of the new generation of business micros. Powerful and versatile, the F-1 features a standard 256K OF RAM (expandable to 768K), with a 16-bit 8086 CPU running MS-DOS and Concurrent CP/M. That's backed up by a built-in 3½" floppy disk drive providing 720K on double-sided disks (you can add another floppy or Winchester drive later). The economical F1E has a 128K RAM and a single-sided 360K disk drive -with the same 92-key professional infra-red keyboard on the F1. And don't forget - when you buy from Spectrum you get the assurance of our trained, expert staff to help and advise you!

F1E SPECTRUM PRICE £955
F1 SPECTRUM PRICE £1095
Excluding VAT. Monitor extra.



Plus Free!

On-site service contract worth £175

Spectrum give you peace of mind with your new computer! There's a twelve month on-site service contract, worth £175, ABSOLUTELY FREE when you buy either a Sanyo 550/555 computer or an Apricot F1E/F1.

Plus Free Business Software.

Both the Sanyo and Apricot computers come complete with a superb pack of comprehensive business software worth hundreds of pounds. The packs contain virtually everything you're likely to need to get the very best from your computer -from Day one!

SEE YOUR NEAREST SPECTRUM PERSONAL COMPUTER STOCKIST FOR DETAILS OF BOTH OFFERS

Sanyo 550/555

Among the very best value in personal computers is the excellent Sanyo 550/555 Series. They feature high performance, 16-bit CPU that runs on MS/DOS, with a RAM that's expandable up to 256K bytes. The 550 has one 160K byte 5¼" floppy disk drive while the 555 has dual drives for professional flexibility. There's a choice of superb hi-resolution Colour or B&W Monitors too (not included). Both come with a comprehensive package of business software, and a very special free maintenance offer. - Take a look at these superb micros at Spectrum NOW!

Sanyo 550
Monitor extra
SPECTRUM PRICE
£749 Excluding VAT.

Sanyo 555
Monitor extra
SPECTRUM PRICE
£999 Excluding VAT.



Your local Spectrum Personal Computer Stockist

Aberystwyth **Aberdata Ltd**
Accrington **P.V.Tubes**
Alfreton **Gordon Harwood**
Bexhill-On Sea **Computerware**
Bognor Regis **Bits & Bytes**
Bolton **Wildings**
Bromley **Computers Today**
Canterbury **Jones Computers Ltd**
Chelmsford **Maxton Hayman**
Chesterfield **Computer Centre**
Chorley **Wildings**
Crawley **Gatwick Computer Services**
Darlington **McKenna & Brown**
Epsom **The Micro Workshop**
Exmouth **Open Channel**
Fakenham **Fastview**
Guernsey **Gruts**
Hull **Computer Centre**
Ipswich **Brainwave Micros Ltd**
Kidderminster & Dudley **Central Computers**
London NW11 **Computers Inc.**
London EC2 **Devron**
London SE1 **Vic Odden**
London SE9 **Square Deal**
London N14 **Logic Sales**
London W1 **Computers of Wigmore Street**
Lowestoft **John Wells Limited**
Liverpool **Hargreaves**
Luton **Terry-More Photo**
Morpeth **Telerents (Northern)**
Norwich **Norwich Camera Centre**
Norwich **Brainwave Micros Ltd**
Nuneaton **Micro City**
Peterborough **Logic Sales**
Plymouth **Syntax**
Potters Bar **Software Agents Ltd**
Preston **Wildings**
Rainham **Microway Computer**
Romford **Brainwave Micros Ltd**
Shrewsbury **Computerama**
Sittingbourne **Computers Plus**
Southampton **L.T.C. Ltd**
Stafford **Computerama**
St Austell **A B & C Computers**
Stevenage **D.J Computers**
Seven Oaks **Ernest Fielder**
Thetford **Thetford C.B & Micro**
Warrington **Wildings**
Walsall **New Horizon Computer**
Waterlooville **GB Microland**
Watford **SRS Microsystems Ltd**
West Bromwich **Bell & Jones**
Whitehaven **P.D.Hendren**
Wigan **Wildings**
Woking **Harpers Computers**
York **York Computer Centre**

See our address page for full addresses and phone Numbers

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Or prospective dealers. If you'd like to know more about becoming a SPECTRUM APPOINTED DEALER, please write to: BOB CLEAVER, Spectrum Group PLC, Hunting Gate, Hitchin, Herts. SG4 0TJ; Tel (0462) 37171

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Incredible value for money

AVT Monitors

DM-216G or DM-216/0

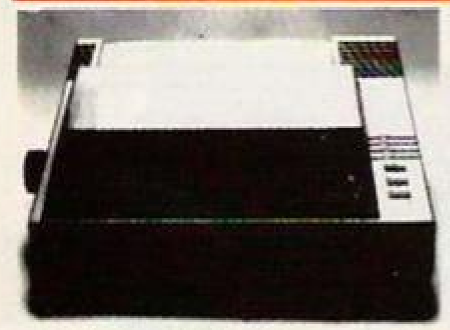


- Available in Green or Orange
- Glare or Non-Glare screens
- For office micros, or Personal Computers

SPECTRUM PRICE



AVT Printer Bargains

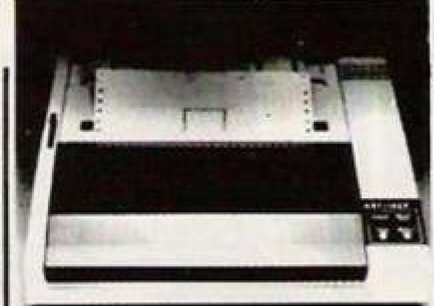


80cps Printer

- 228 ASCII characters
- 640 dots/line .p/sec
- Centronics Parallel
- Opt. RS232C Serial
- Sprocket & Friction feed
- Semi-graphics
- Normal & italic fonts

SPECTRUM PRICE





100cps Printer

- Letter Quality dot matrix
- 80/132 cols
- Serial & Parallel
- Tractor & Friction feed
- Graphics

SPECTRUM PRICE



Brother HR-5 Printer



A great printer at a top-value price from Spectrum. Here's what you get:

- Letter-quality daisy-wheel printing
- Between 13 and 18cps
- Bi-directional printing
- Tractor-fed paper or single sheets
- Super low price!

SPECTRUM PRICE

£159.95

Brother EP-44

'Transforming Office Machines', runs Brother's slogan – with these super-compact battery powered typewriters, it's easy to see why!

- Top quality thermal head
- 4K of text memorise (3 A4 pages)
- Centering if required
- 15-digit LCD display for pre print corrections
- Line-by-line edit facility



NEW! Music Maker

For Commodore 64

A superb new music system for the Commodore 64 micro, with everything that's needed for high qualiy music making. The package price includes Software (on either Disk or Cassette), a 24-key piano-style keyboard which fits over the computer keyboard, and a songbook containing 28 popular songs. Music Maker is versatile, but simple to use it suits both beginners and experienced musicians. There are 8 voices to simulate instruments (including piano, guitar and synthesiser); all the sound parameters can be varied, to create any sound within the 64's capabilities. Different menu-selected modes include one which creates rhythms, from waltzes to disco, and pre-programmed bass patterns that you can create around the tune. The Music Maker is an incredible addition to the Commodore 64 superb music for everyone!



Not all stores carry every advertised item, please phone before making a journey - prices correct at time of going to press E&OE



Up to £1000 Instant Credit

• There's up to £1,000 worth of Instant Credit available on a Spectrum Chargecard. See your local SPECTRUM dealer for written details (UK mainland only) Typical APR -29.8%

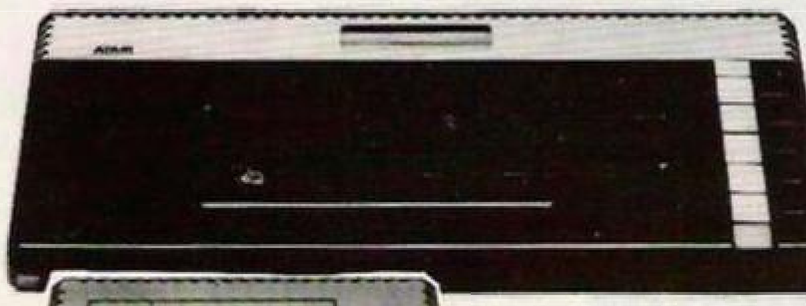
Latest News

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MASSIVE SAVINGS

ON THESE TOP SELLING MICROS

Atari 800XL





Plus!

Atari 1010

Data Recorder

Plus!

Basic Tutor

SAVE £50

This powerful and versatile home computer packs the punch of a full 64K of user RAM memory, to make the most of exciting games and educational software. Among its up-to-date features are a high quality full-stroke keyboard, three-and-a-half octaves of sound synthesis and a superb dscreen display capability that includes 11 Graphic Display modes and a palette of 256 colours—128 of which can be displayed together at any one time. Ask your local Spectrum dealer to show you the amazing Atari today!

Normally £249.99

SENSATIONAL PRICE

£199.95

BBC Model B

With Speech Synthesiser fitted

The BBC MODEL B probably the most flexible personal microcomputer available today. Using powerful BBC BASIC, the BBC B is widely accepted as providing the educational standard for computer learning.

The Model B features a variety interface ports allowing easy connection of both standard peripherals (like disk drives and printers) and second processors or other devices to give you access to Teletext or Prestel services.

SAVE £55

Total Normal Price £454

SENSATIONAL PRICE



Acorn Electron

Plus 5 Software Cassettes



The Electron gives high quality graphics output to either colour TV or monitor. Sound can be generated through the internal loudspeaker. The Electron comes complete with a free introductory cassette, containing 19 free programmes & two manuals—the User Guide and 'Start Programming With The Electron'.

£199

Spectrum Computer Centres have no connection whatsoever with the ZX Spectrum Computer manufactured by Sinclair Research Ltd

Computer Dealers

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Micro Dealers UK's

Top 50

Britain's No.1 Software Chart

Program	Supplier	Machine	Price
Underwurlde	Ultimate	Spectrum	£9.95
Tir Na No	Gargoyle Games	Spectrum	£9.99
Eureka	Domark	CBM 64	£14.95
Eureka	Domark	Spectrum	£14.95
Fort Apocalypse	Synsoft/US Gold	CBM 64	£9.95
Daley Thompson's Decathlon	Ocean	Spectrum	£6.90
Raid Over Moscow	Access/US Gold	CBM 64	£9.99
Knight Lore	Ultimate	Spectrum	£9.95
Psi-Warrior	Beyond	CBM 64	£9.95
Backpackers Guide	Fantasy	Spectrum	£7.50
Travels with Trashman	New Generation	Spectrum	£9.95
Bruce Lee	Datasoft/US Gold	CBM 64	£9.95
Jasper	Micromega	Spectrum	£8.95
Eddie Kid Jump Challenge	Martech	Spectrum	£6.95
Combat Lynx	Durell	Spectrum	£8.95
Cyclone	Vortex	Spectrum	£6.95
Jinn Genie	Micromega	CBM 64	£8.95
Pyjamarama	Micro Gen	Spectrum	£6.95
Suicide Express	Gremlin	CBM 64	£7.95
Elite	Acornsoft	BBC	£14.95
Select 1	Computer Records	Spectrum	£12.49
Fighter Pilot	Digital	CBM 64	£9.95
Select 1	Computer Records	CBM 64	£12.49
Steve Davis Snooker	CDS	Spectrum	£6.95
Cliffhanger	New Generation	CBM 64	£7.95
Havoc	Dynavision	Spectrum	£7.95
Jet Set Willy	Software Projects	CBM 64	£7.95
Aztec (Hunt for the Sun God)	Hill MacGibbon	Spectrum	£7.95
King Arthur's Quest	Hill MacGibbon	Spectrum	£7.95
Skool Daze	Microsphere	Spectrum	£6.95
Sherlock	Melbourne House	CBM 64	£14.95
Valkyrie 17	Ram Jam	Spectrum	£9.95
Braxx Bluff	Micromega	Spectrum	£6.95
Zaxxon	Synsoft/US Gold	CBM 64	£9.95
Boulder Dash	State Soft	CBM 64	£8.95
D-Day	Games Workshop	Spectrum	£7.95
Avalon	Hewson	Spectrum	£7.95
Tower of Despair	Games Workshop	Spectrum	£7.95
Battlecars	Games Workshop	Spectrum	£7.95
Kosmic Kanga	Micromania	CBM 64	£6.95
Manic Miner	Software Projects	Amstrad	£8.95
Xavior	PSS	Spectrum	£7.95
Beachead	Access/US Gold	Spectrum	£7.95
Beam Rider	Activision	Spectrum	£7.99
Dues ex Machina	Automata	Spectrum	£15.00
Manic Miner	Software Projects	BBC	£7.95
3D Grand Prix	Software Invasion	BBC	£9.95
Kentilla	Micromega	Spectrum	£6.95
Dark Star	Design Design	Spectrum	£7.50
Summer Games	Quicksilva	CBM 64	£14.95





Omega
Compucorder

- Battery/Mains Operation
- Built-in condensor microphone
- Automatic level control
- 3-digit Tape Counter
- DIN Socket

GREAT VALUE AT ONLY £24.95

BBC Emulator

This superb unit enables you to process your BBC projects on your Commodore 64 at home. All you do is type programs in BBC BASIC and the Emulator allows your Commodore 64 to 'imitate' the BBC.

Spectrum Price £13.95

Quickshot
II Joystick



Helicopter-style grip with the Fire button on top. Features suction feet for stability and Auto Fire mode. Compatible with most micros.

£11.95

Super Value Shado Add-Ons

Shado BBC
Compatible Data Recorder

Also suitable for other micros



This neat, stylish data cassette recorder is a terrific value-for-money way to save your program and data from your BBC Acorn or Electron micro. The Shado connects easily, offers reliable and consistent performance and features a Tape Position indicator for easier data access.

Spectrum Price



Commodore 64
Compatable Data Recorder



Directly compatible with the Commodore 64 and VIC-20 micros, this excellent data recorder eliminates the problems of using ordinary cassette recorders - at a top value price too!

Spectrum Price



Shado Joysticks for the BBC

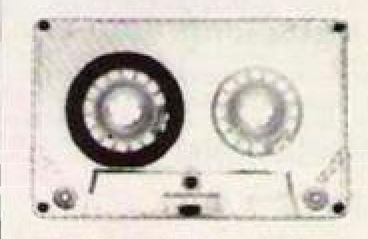


Designed as direct replacements for the Acorn originals, these superfast joysticks (connected to the Analogue port) feature much improved hand action with sprung response. left & right are identified by the colour of the fire buttons.

Spectrum Price Per Pair



Blank Data Cassettes



C12 Standard Data Cassette. 50p
C15 Standard Data Cassette. 58p
C12 Reel to Reel. . . . 75p

Not all stores carry every advertised item, please phone before making a journey - prices correct at time of going to press E&OE



Up to £1000 Instant Credit

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AVON

BATH Software Plus, 12 York St Tel: (0225) 61676
WESTON-S-MARE K & K Computers, 32 Alfred St Tel: (0934)419324

BEDFORDSHIRE

DUNSTABLE Dormans 7-11 Broad Walk Tel: (0582) 65515
LEIGHTON BUZZARD The Computer Ctr at Milton Keynes Music, 17 Bridge St. Tel: (0525)376622
LUTON Terry-More, 49 George St. Tel: (0582) 23391/2

BERKSHIRE

BRACKNELL Computer Centre, 44 The Broadway. Tel: (0344) 427317
NEW! **WINDSOR Gadgets 30 Peascod Str., Tel: (07535) 67211**
SLOUGH MU Games and Computers 245 High St. Tel: (0753) 21594

BUCKINGHAMSHIRE

BLETCHLEY Rams Computer Centre, 117 Queensway. Tel: (0908) 647744
CHESHAM Reed Photography & Computers, 113 High St. Tel: (0494) 783373

CAMBRIDGESHIRE

CAMBRIDGE K P Computers Ltd. 19/20 Market St. Tel: (0223) 312240 (Open 6 Days)
HUNTINGDON T.S.C. Electronics, 3 All Saints Passage, High St. Tel: (0480) 411579
PETERBOROUGH Logic Sales, 6 Midgate Tel: (0733) 49696
PETERBOROUGH Ptrbrgh Communications, 91 Midland Rd. Tel: (0733) 41007

CHANNEL ISLANDS

GUERNSEY Gruts, 3-5 The Pollett, St Peter Port. Tel: (0481) 24682
JERSEY Audio & Computer Centre, 7 Peter St, St Helier. Tel: (0534) 74000

CHESHIRE

ALTRINCHAM Mr Micro 28 High St. Tel: (061) 941 6213
NEW! **CHESTER Computer Link 21 St Werburgh St Tel: (0244) 316516**
CREWE Microman Unit 2, 128 Nantwich Rd. Tel: (0270) 216014
ELLESMERE PORT RFR Computers, 1 Pooltown Rd. Whitby. Tel: 051 356 4150
STOCKPORT Wilding Ltd. 1 Little Underbank Tel: (061) 480 3435
WARRINGTON Wildings, 111 Bridge St. Tel: (0925) 38290
WIDNES Computer City, 78 Victoria Road. Tel: (051) 420 3333
WILMSLOW Swift of Wilmslow, 4-6 St. Annes Parade. Tel: (0625) 526213

CLEVELAND

MIDDLESBOROUGH McKenna & Brown, 206 Linthorpe Rd. Tel: (0642) 222368

CORNWALL

ST AUSTELL A B & C Computers, Duchy House, 6 Lower Aylmer Sq. Tel: (0726) 67337
TRURO Truro Micro Ltd. Unit 1, Bridge Ho., New Bridge St. Tel: (0872) 40043

CUMBRIA

BARROW-IN-FURNESS Barrow Computer Centre, 2/4 The Mall. Tel: (0229) 38353
CARLISLE The Computer Shop, 56-58 Lowther St. Tel: (0228) 27710
PENRITH Penrith Communications, 14 Castlegate. Tel: (0768) 67146 Open Mon-Fri till 8pm
WHITEHAVEN P D Hendren 15 King St. Tel: (0946) 2063

DERBYSHIRE

ALFRETON Gordon Harwood 69-71 High St. Tel: (0773) 832078
CHESTERFIELD The Computer Centre, 14 Stephenson Place Tel: (0246) 208802
NEW! **NEW MILLS New Mills Micro Centre 388 Market Street, Tel: (0663) 47332**

DEVON

EXETER Seven Counties (Computers) Ltd., 7 Paris Street. Tel: (0392) 211211
EXMOUTH Open Channel, 30 The Strand. Tel: (0395) 264408
PLYMOUTH Syntax Ltd., 76 Cornwall St. Tel: (0752) 28705
TIVERTON Actron Micro Computers, 37 Bampton St. Tel: (0884) 252854

DORSET

BOURNEMOUTH Lansdowne Computer Ctr 1 Lansdowne Crescent. Tel: (0202) 20165
NEW: DORCHESTER Seven Counties Cptrs. 20 High Street East Tel: (0305) 66022
NEW! **POOLE Lansdowne Cptr Centre 14 Arndale Centre Tel: (0202) 670901**

DURHAM

DARLINGTON McKenna & Brown, 102 Bondgate. Tel: (0325) 459744

ESSEX

BASILDON Godfrey's 28-32 East Walk, Tel: (0268) 289379
BASILDON Godfrey's Computer Centre, 5 Laindon Main Centre Laindon. Tel: (0268) 416747
NEW! **CANVEY ISLAND Tower Radio Ltd. 43 High Str., Tel: (0268) 682211**
NEW! **CHELMSFORD Way-In Cptrs. 7 Village Square Chelmer Village Tel: (0245) 467858**
CHELMSFORD Maxton Hayman Ltd., 5 Broomfield Rd. Tel: (0245) 354595
COLCHESTER Brainwave 51 Head St. Tel: (0206) 561513
GRAYS H Reynolds. 79 Orsett Rd. Tel: (0375) 5948
ILFORD Woolfmans, 76 Ilford Lane. Tel: (01) 478 1307
NEW! **ROMFORD 92 Market Place Tel: (0708) 41719**
SOUTHEND Computer Centre 332 London Rd. Tel: (0702) 337161

HAMPSHIRE

BASINGSTOKE Fisher's, 2-3 Market Place. Tel: (0256) 22079
PORTSMOUTH (Waterlooville)G B Microland, London Rd., (Opp. Co-op) Tel: (0705) 259911
SOUTHAMPTON L.T.C. Ltd., 112 East St., Tel: (0703) 333958/24703
WINCHESTER Winchester Camera & Computer Centre, 75 Parchment St. Tel: (0962) 53982

HEREFORD

HEREFORD Melgray Hi-Tech Ltd., 53/54 Commercial Str. Tel: (0432) 275737

HERTFORDSHIRE

HITCHIN GK Photographic & Computers, 68A Hermitage Rd., Tel: (0462) 59285
POTTERS BAR The Computer Shop, 197 High St. Tel: (0707) 44417
ST ALBANS (Herts) Clarks Computer Centre 14-16 Hollywell Hill. Tel: (0727) 52991
STEVENAGE D J Computers, 11 Town Square. Tel: (0438) 65501
WATFORD SRS Microsystems Ltd., 94 The Parade, High St. Tel: (0923) 26602
WELWYN GARDEN CITY D J Computers, 40 Fretherne Rd., Tel (07073) 28435/28444

HUMBERSIDE

BEVERLEY Computing World, 10 Swaby's Yard Dyer Lane. Tel: (0482 881831
GRIMSBY RC Johnson Ltd., 22 Friargate, Riverhead Centre. Tel: (0472) 42031
HULL The Computer Centre, 26 Anlaby Rd. Tel: (0482) 26297

ISLE OF MAN

DOUGLAS T H Colebourn Ltd., 57-61 Victoria St. Tel: (0624) 3482

ISLE OF WIGHT

COWES Beken & Son. 15 Bath Rd. Tel: (0983) 297181

KENT

BECKENHAM Supa Computers Ltd. 425 Croydon Rd., Tel: (01) 650 3569
BROADSTAIRS Video Vision 19/20 Willow Court, St. Peters Park Road Tel: (0843) 63284 (No Early Closing Day)
BROMLEY Computers Today 31 Market Square Tel: (01) 290 5652
CANTERBURY Ctbury Computer Centre 56/57 Palace St. Tel: (0227) 62101
DOVER Kent Photos & Computers, 4 King St. Tel: (0304) 202020
GRAVESEND Marshalls Computers & Cameras, 3 Windmill St. Tel: (0474) 65930
RAINHAM Microway Computers Ltd., 39 High St. Medway Towns. Tel: (0634) 376702
SEVENOAKS Ernest Fielder Computers, Dorset St. Tel: (0732) 456800
SITTINGBOURNE Computers Plus, 65 High St. Tel: (0795) 25677
NEW! **TUNBRIDGE WELLS Modata Computers Ltd. 28-30 St Johns Rd. Tel: (0892) 41555**

LANCASHIRE

ACCRINGTON PV Computers, 104 Abbey St. Tel: (0254) 36521/32611
PRESTON Wilding's, 49 Fishergate. Tel: (0772) 556250

LEICESTERSHIRE

MARKET HARBOROUGH Harborough Home Computers, 7 Church St. Tel: (0858) 63056

LONDON

E8 Percivals, 85 High St. North, East Ham. Tel: (01) 472 8941
E17 Erol Computers Ltd., 125 High Street Walthamstow Tel: (01) 520 7763
EC2 Devron Computer Centre, 155 Moorgate Tel: (01) 638 3339/1830
N14 Logic Sales, 19 Broadway, The Bourne, Southgate. Tel: (01) 882 4942
N20 Castlehurst Ltd. 1291 High Rd. Tel: (01) 446 2280
NW4 Da Vinci Computer Store, 112 Brent St., Hendon Tel: (01) 202 2272
NW11 Computers Inc., 86 Golders Green Rd. Tel: (01) 209 0401/0279
SE1 Vic Odden's 6 London Bridge Walk. Tel: (01) 403 1988
SE9 Square-Deal, 373-375 Footscray Rd., New Eltham. Tel: (01) 859 1516
SE15 Castlehurst Ltd., 152 Rye Lane, Peckham. Tel: (01) 639 2205
W1 Computers of Wigmore St., 104 Wigmore St. Tel: (01) 935 2452
W1 Sonic Foto & Micro Centre, 256 Tottenham Court Rd. Tel: (01) 580 5826
NEW! **W1 Ramsons 4 Edgware Rd., Tel: (01) 724 2373**

GREATER MANCHESTER

BOLTON Wilding Ltd., 23 Deansgate. Tel: (0204) 33512
MANCHESTER Lomax Ltd., 11 St Mary's Gate Tel: (061) 832 6167
OLDHAM Home & Business Computers Ltd., 54 Yorkshire St. Tel: (061) 6331608
ROCHDALE Home & Business Computers, 75 Yorkshire St. Tel: (0706) 344654
SWINTON Mr Micro Ltd., 69 Partington Lane. Tel: (061) 728 2282 Late Night Friday
WIGAN Wilding Ltd., 11 Mesnes St. Tel: (0942) 44382

MERSEYSIDE

BIRKENHEAD Fairs Cameras & Hi-Fi, Dacre Hill, Rock Ferry. Tel: (051) 645 5000
HESWALL Thornguard Computer Systems, 46 Pensby Rd. Tel: (051) 342 7516
HUYTON Ian Houghton 5 Huyton Hey Rd. Tel: (051) 489 5785
NEW! **LIVERPOOL Home & Business Cptrs 31 Bold St. Tel: (051) 708 0428**
LIVERPOOL Beaver Radio, 20-22 Whitechapel. Tel: (051) 709 9898
LIVERPOOL (Aintree) Hargreaves, 31-37 Warbreck Moor. Tel: (051) 525 1782

MIDDLESEX

HARROW Camera Arts, (Micro Computer Division) 42 St Ann's Rd. Tel: (01) 427 5469
TEDDINGTON Andrews, Broad St. Tel: (01) 977 4716
NEW! **PINNER P&H Micro & Photo Ltd 91 Field End Rd., Eastcote Tel: (01) 868 6830/0860**
UXBRIDGE J K L Computers, 7 Windsor St. Tel: (0895) 51815

NORFOLK

FAKENHAM Fastview, 12 Norwich Rd. Tel: (0328) 51319
KING'S LYNN Computer Plus, 40 Conduit St. Tel: (0553) 4550
NORWICH Norwich Camera Centre 20 White Lion Str. Tel: (0603) 612537
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NORTHAMPTON Dormans, 22 Princes Walk Grosvenor Centre. Tel: (0604) 37031

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NOTTINGHAM Jacobs Cptrs. 13 Middlegate Newark. Tel: (0636) 72594
NEW! **NOTTINGHAM Amplitone Ltd., 3 Mansfield Road. Tel: (0602) 418191**
WORKSOP Computagrafix, 132 Bridge St. Tel: (0909) 472248

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BELFAST Arthur Hobson Ltd., 37 Great Victoria St. Tel: (0232) 246336
PORTSDOWN Pedlows, 16 Market St., Craigavon Co. Armagh. Tel: (0762) 332265
LONDONDERRY Foyle Computer Systems, 3 Bishop St. Tel: (0504) 268337
NEWRY Newry Computer Centre. 34 Monaghan St. Tel: (0693) 66545

NORTHUMBERLAND

MORPETH Telerents 31 Newgate St. Tel (0665) 513 537

OXFORDSHIRE

ABINGDON Ivor Fields Computers, 21 Stert St. Tel: (0235) 21207
BANBURY Computer Plus, 2 Church Lane. Tel: (0295) 55890
OXFORD Ivor Fields, 7 St Ebbes St. Tel: (0865) 247082

SCOTLAND

NEW! **ABERDEEN Dee Micro 278 George Street Tel: (0224) 644350**
ABERDEEN North East Computers, 1-3 Ellis St., Peterhead. Tel: (0779) 79900
AYR Vennals, 6A New Bridge St. Tel: (0292) 264124
DUMFRIES Vennals, 71 English St. Tel: (0387) 54547
NEW! **DUNDEE Micromania 60 Gray St., Boughty Ferry Tel: (0382) 77130**
EDINBURGH The Silicon Centre, 6-7 Antigua St. Tel: (031) 557 4546
HAMILTON Tom Dickson Computers, 8-12 Cadzow St. Tel: (0698) 283193

SHROPSHIRE

NEW! **Services Ltd., Smithfield Ctr Whitburn St. Tel: (07462) 61458**
SHREWSBURY Computerama, 13 Castlegate. Tel: (0743) 60528
TELFORD Cptr Village, 4 Hazeldine House Telford Town Centre. Tel: (0952) 506771

SOMERSET

TAUNTON Grays, 1 St James St. Tel: (0823) 72986

STAFFORDSHIRE

STAFFORD Computerama, 59 Forgate St. Tel: (0785) 41899
STOKE-ON-TRENT Computerama, 11 Mkt Square Arcade Hanley. (0782) 268620
STOKE-ON-TRENT The Microchip, 37 Station Rd. Biddulph Tel: (0782) 511559

SUFFOLK

BURY ST EDMUNDS Guildhall Cptr Ctr, 11 Guildhall St. Tel: (0284) 705772
IPSWICH Brainwave, 24 Crown St. Tel: (0473) 50965
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Ask an expert why the Electron's the best micro in its class.

Most schoolchildren will tell you that one computer prevails in British classrooms today. Acorn's BBC Micro.

With a hint of pride, they'll also tell you that they're fluent in the computer language which Acorn developed for the BBC Micro. It's called BBC Basic.

And if you ask their advice on choosing a home computer for around £200, they're likely to tell you that there's really only one sensible choice.

The £199 Acorn Electron.

Like its £399 stablemate, but unlike any other micro, the Electron speaks BBC Basic. Which means that children can easily carry on with their computer studies at home. And their parents can quickly start catching up, because BBC Basic is such a simple language to learn.

However, language isn't the only thing which makes the Electron outstanding among every other micro in its price range.

A powerful choice.

The Electron is a 64K microcomputer which has 32K of RAM, combined with another 32K ROM.

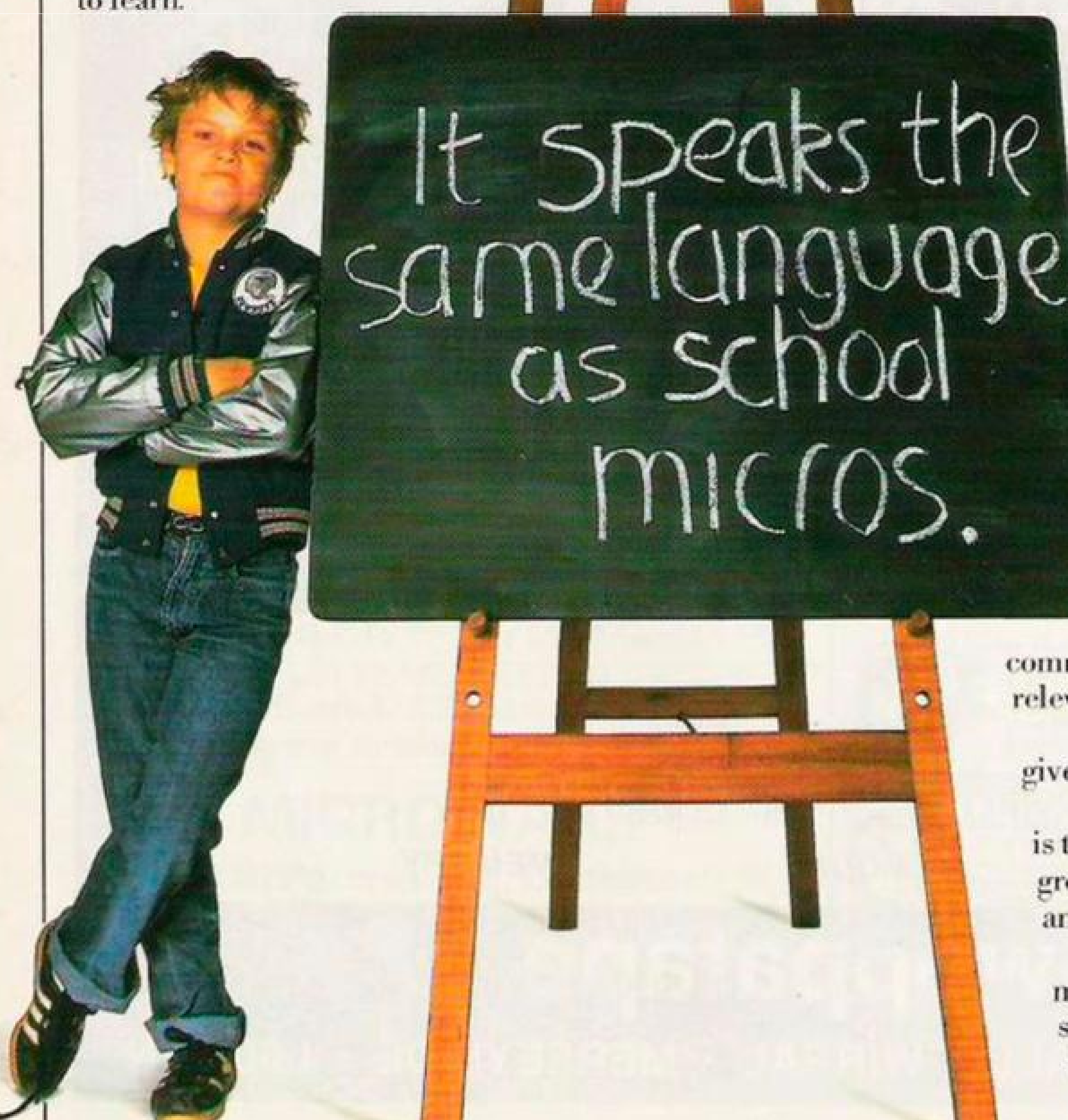
This simply means that it has more power than most people ever need from a home computer.

Nevertheless, it has been designed to help you make the fullest use of its power.

For example, its graphics have the highest resolution of any home computer bar none.

This is because Acorn specially designed the chip that controls the graphics. And it's among the most advanced chips of its kind.

Indeed, it delivers twice as many characters across the screen as the Electron's nearest rival.



It expands into a system.

With the Electron, even total newcomers have been surprised at how quickly they can find their way into the complex world of computing.

Where many computers have keyboards which are confusing and clumsy to operate, it has a keyboard just like an ordinary electric typewriter's.

And for issuing main commands, there are single entry keys. Instead of literally spelling out the command, letter by letter, you just push the relevant key and it's issued.

There's also a built-in loudspeaker which gives high quality sound.

And what is perhaps most exciting is that the Electron has the capacity to grow with your knowledge and ambition.

With Acorn's Plus 1 expansion module, it can link up with a printer, joy sticks and fast-load cartridge software including View and Viewsheet word processing and spread sheet programs.



With the Plus 3 module, which ill soon be available, you'll have a isc drive system and will be able o enjoy all the speed and conven-ience of 3.5 inch discs.

But let's not get carried away oo quickly. You can start using and njoying your Electron as soon as ou get it home.

All you need is your tele-ision set and a cassette recorder.

The speed of a business micro.

Some home computers espond pretty slowly to your commands. After you've pressed the keys, they leave you twiddling your thumbs for more than a mere few seconds.

The plodders, how-ever, are a very long way behind the Electron.

In fact, on processing speed, a recent bench test survey ranked he Electron up with such high fliers as the IBM PC and the pple III. Both are machines which cost well over £1,000.

It's an astonishing accolade when the Electron makes o greater claim than to be a micro which is designed to ecome part of the family.

Your starter for free.

With your Electron, you'll receive a free intro-luctory cassette.

It will give you a taste of the exceptional colour raphics. It will show you how the Electron can play and otate music.

And when it's given you some new ideas about home accounting, it will challenge you to a few games and even spend a few seconds doing your whole family's biorhythms for you.

But remember, although it holds 15 programs, the cassette will only give you a glimpse of the Electron's full potential.

Because the potential is as infinite as your own imagination.

No shortage of software.

Although the Electron is still a relative newcomer to the market, the range of software available for it is considerable.

Besides plenty of games, there are many edu-cational programs for children of all ages, from playschool to A Level.

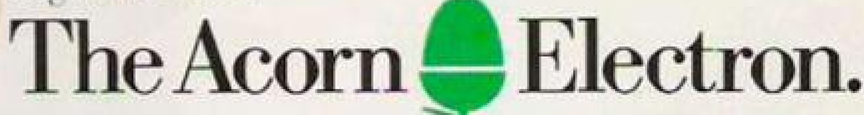
There's a great deal to keep adults occupied, too. From money management to helpful domestic programs, even a range of foreign language programs, teaching the basics of French, German, Italian and Spanish.



And of course, with its simplicity and flexibility, the Electron could soon be processing programs created and written by none other than yourself.

You can find the Acorn Electron with its full complement of accessories and software at local Acorn dealers and major high street stores.

For the address of your nearest supplier, ring 0933 79300.





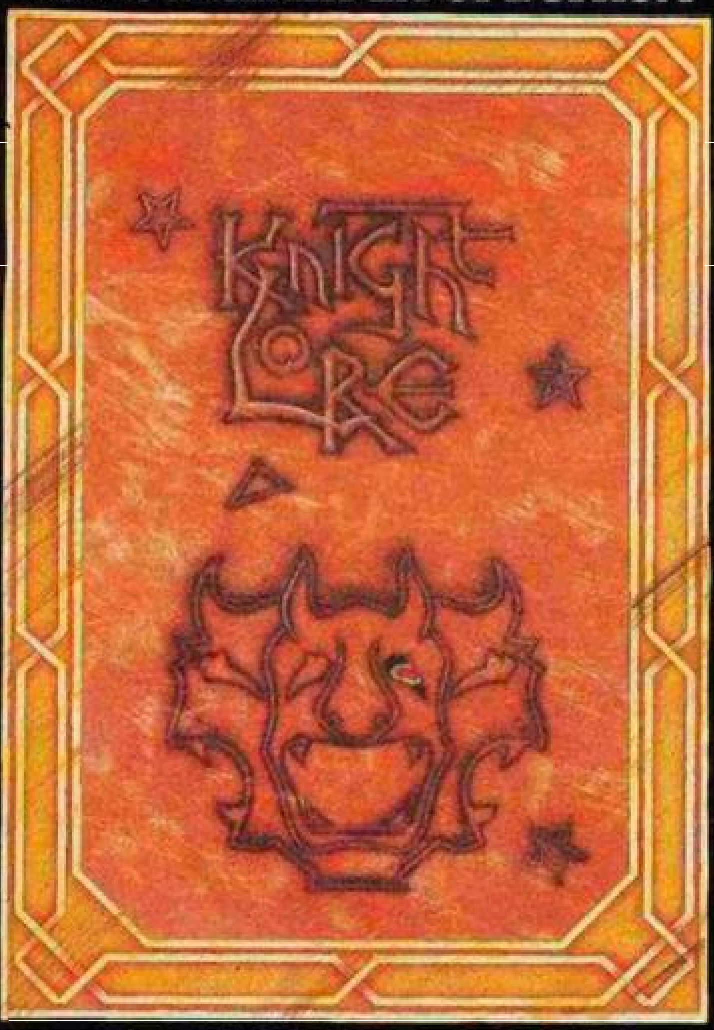
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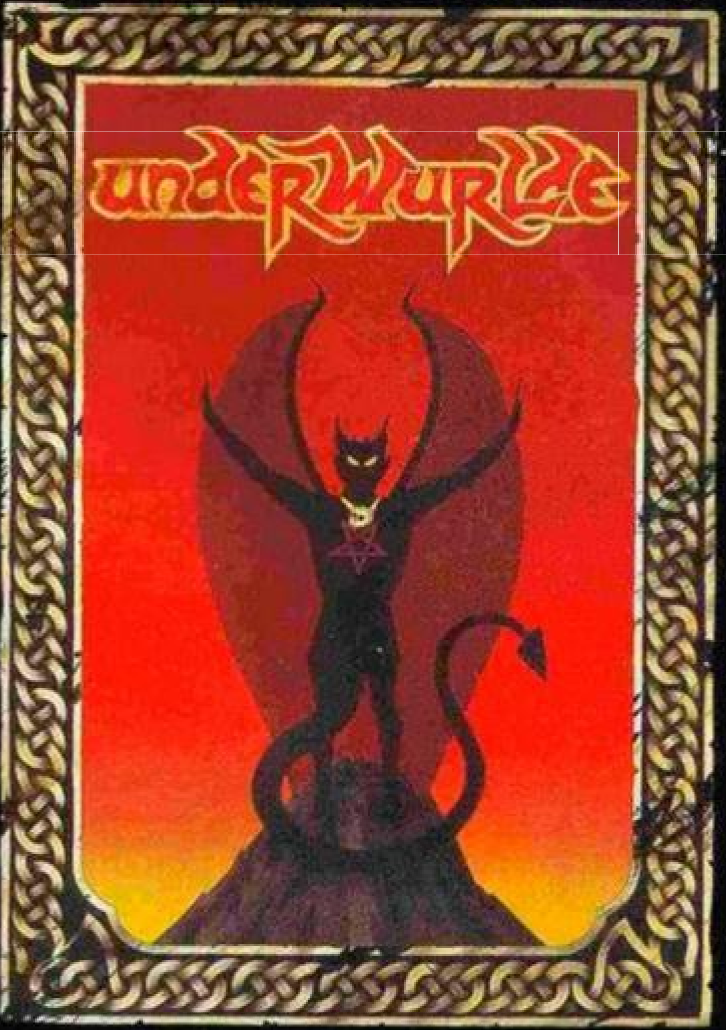
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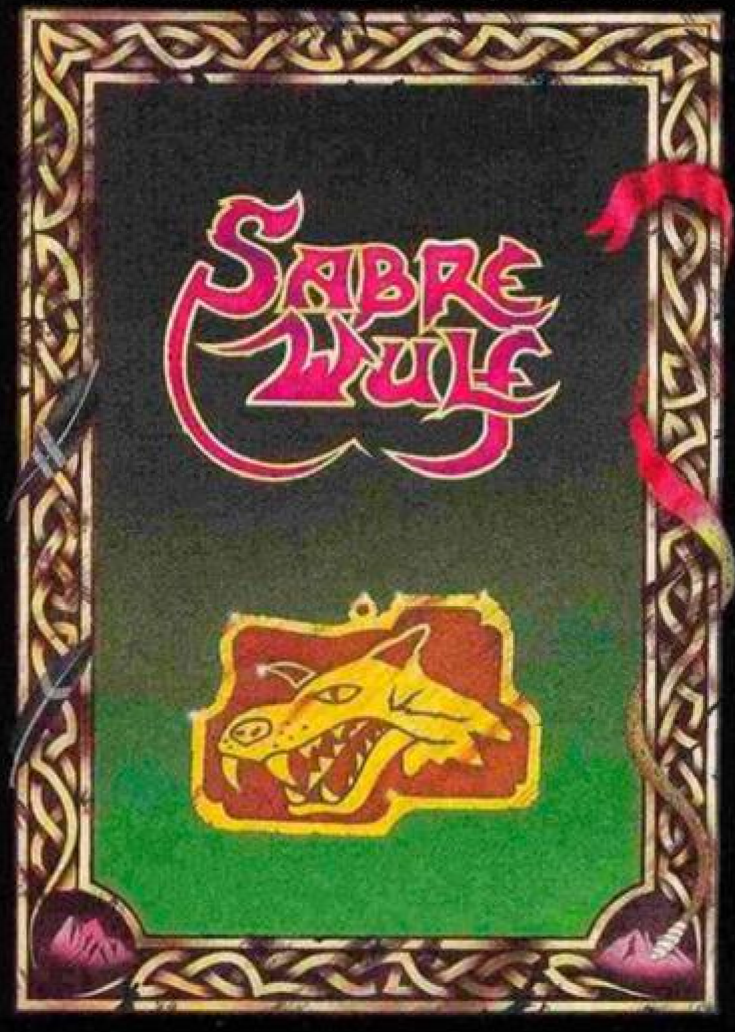
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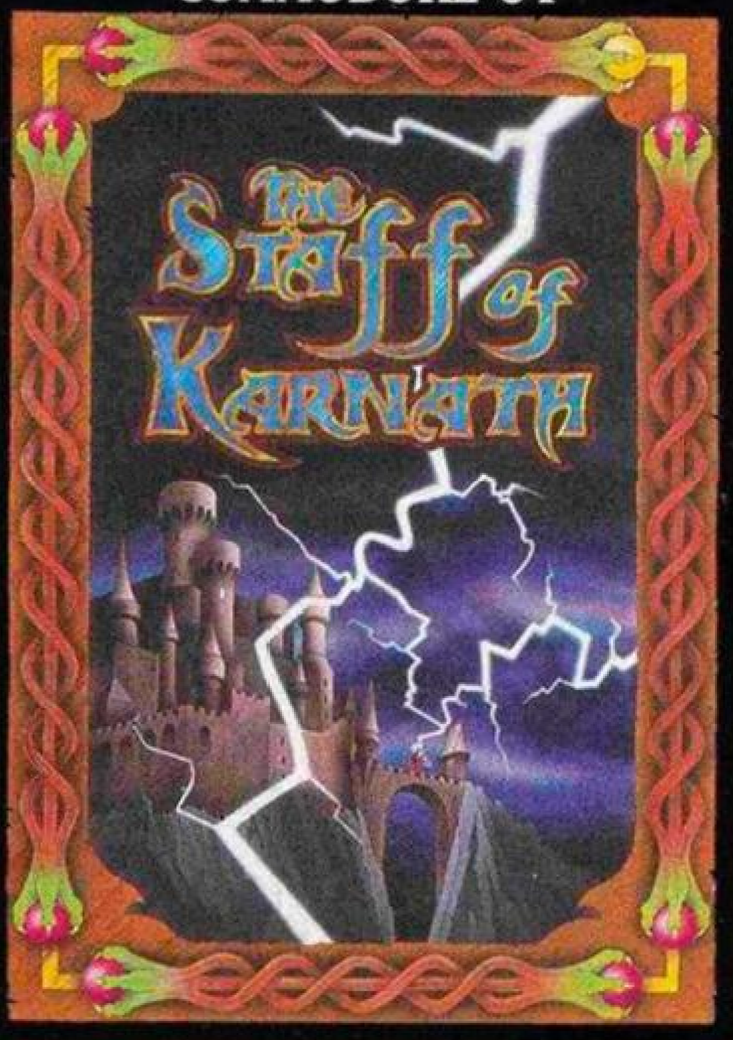
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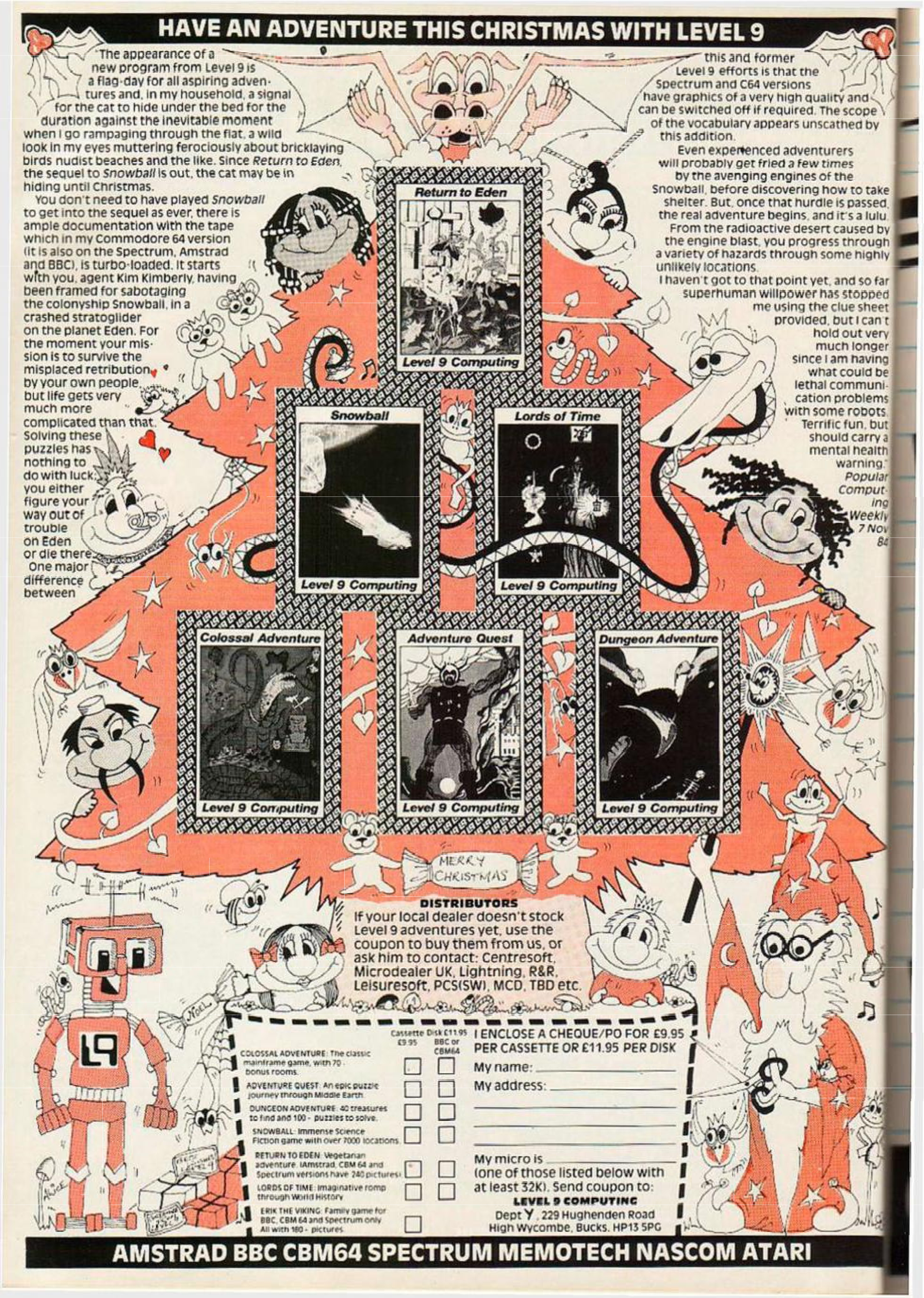
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COMMODORE 64



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HAVE AN ADVENTURE THIS CHRISTMAS WITH LEVEL 9
"The appearance of a new program from Level 9 is a flag-day for all aspiring adventures and, in my household, a signal for the cat to hide under the bed for the duration against the inevitable moment when I go rampaging through the flat, a wild look in my eyes muttering ferociously about bricklaying birds nudist beaches and the like. Since Return to Eden, the sequel to Snowball is out, the cat may be in hiding until Christmas.
You don't need to have played Snowball to get into the sequel as ever, there is ample documentation with the tape which in my Commodore 64 version (it is also on the Spectrum, Amstrad and BBC), is turbo-loaded. It starts with you, agent Kim Kimberly, having been framed for sabotaging the colonyship Snowball, in a crashed stratoglider on the planet Eden. For the moment your mission is to survive the misplaced retribution by your own people, but life gets very much more complicated than that. Solving these puzzles has nothing to do with luck: you either figure your way out of trouble on Eden or die there.
One major difference between this and former Level 9 efforts is that the Spectrum and C64 versions have graphics of a very high quality and can be switched off if required. The scope of the vocabulary appears unscathed by this addition.
Even experienced adventurers will probably get fried a few times by the avenging engines of the Snowball, before discovering how to take shelter. But, once that hurdle is passed, the real adventure begins, and it's a lulu. From the radioactive desert caused by the engine blast, you progress through a variety of hazards through some highly unlikely locations.
I haven't got to that point yet, and so far superhuman willpower has stopped me using the clue sheet provided, but I can't hold out very much longer since I am having what could be lethal communication problems with some robots. Terrific fun, but should carry a mental health warning."
Popular Computing Weekly 7 Nov 84
Return to Eden
Level 9 Computing
Snowball
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Lords of Time
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The Acorn Electron Computer

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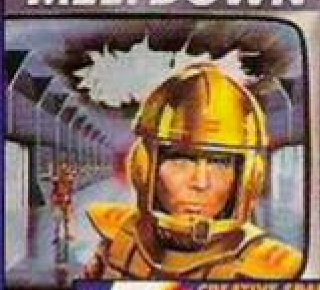
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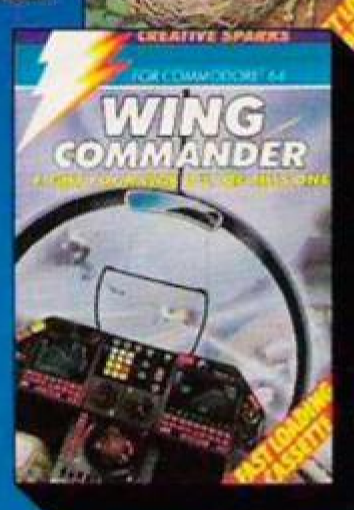


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PRECISION PLOTTER. A high-resolution drawing board which allows you to draw anything on the screen. Facilities like CIRCLE, FILL, ARC, PLOT, DRAW, ERASE, OVER, DRAW RADIALLY, INK, BRIGHT etc are included and easy to use!

SCREEN PLANNER gives you the best of both worlds! The combined use of PRECISION PLOTTER and your Banks of UDG's for highly detailed and precise screen graphics.

The program is complete with DEMO on side two of the cassette and a 28 page instruction booklet.

PAINTBOX can be used with Joysticks and is Sinclair Microdrive compatible.

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Instant Machine Code for graphics and text

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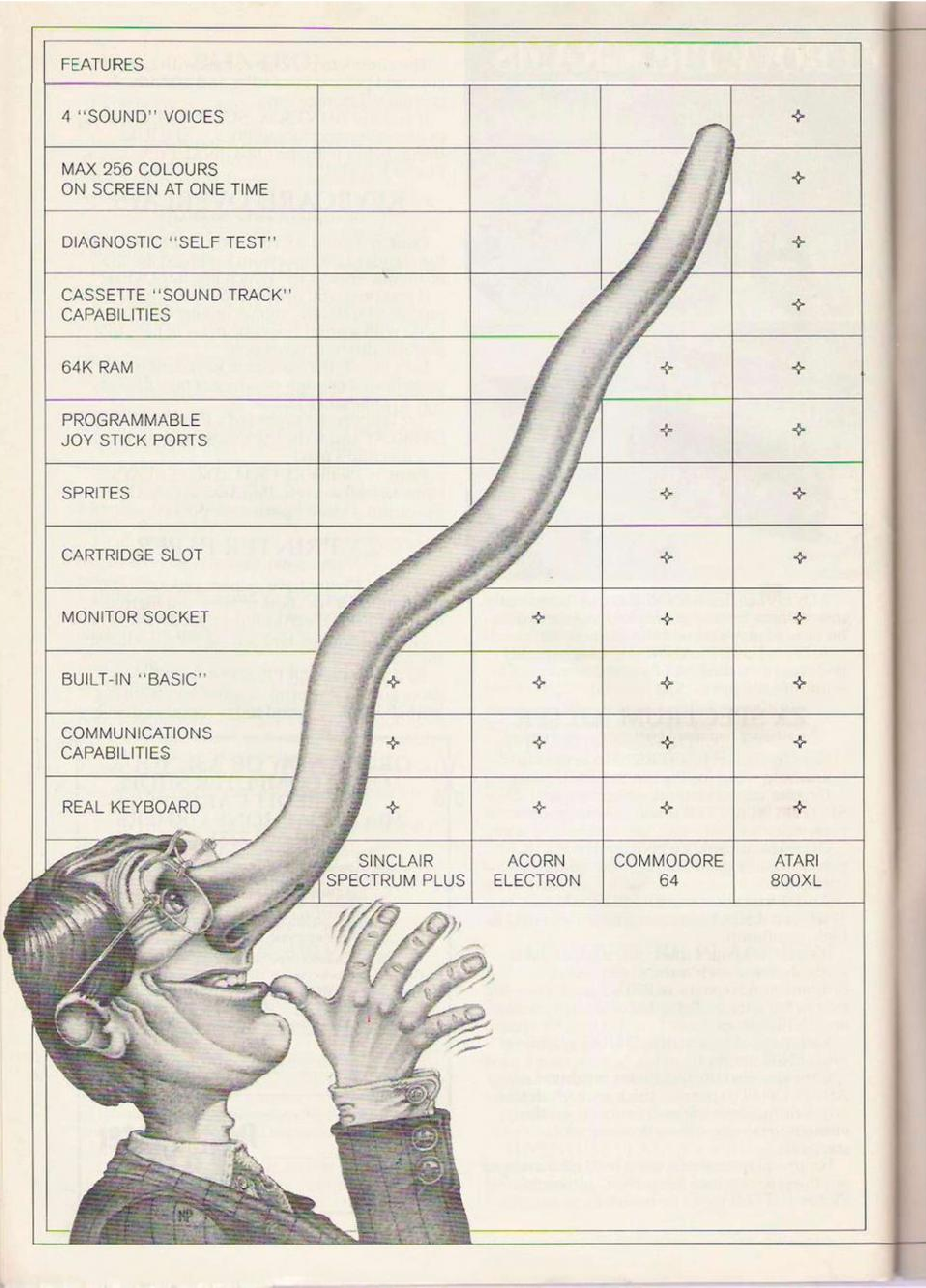
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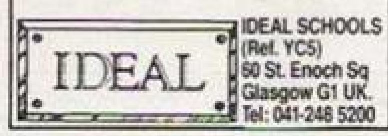
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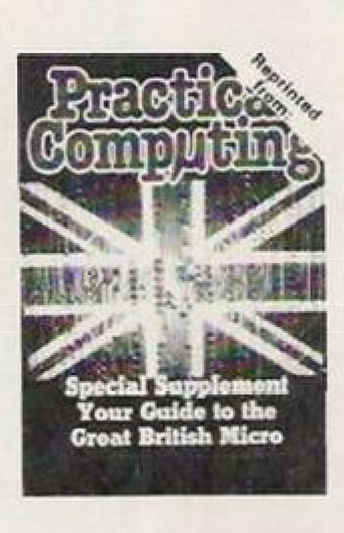
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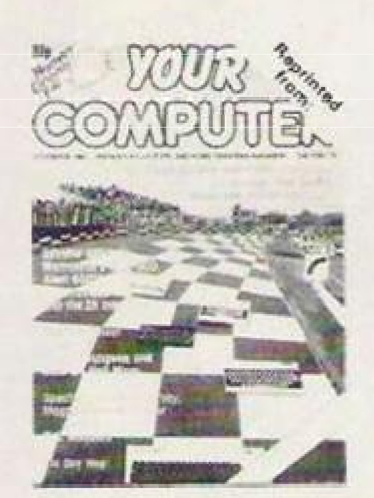
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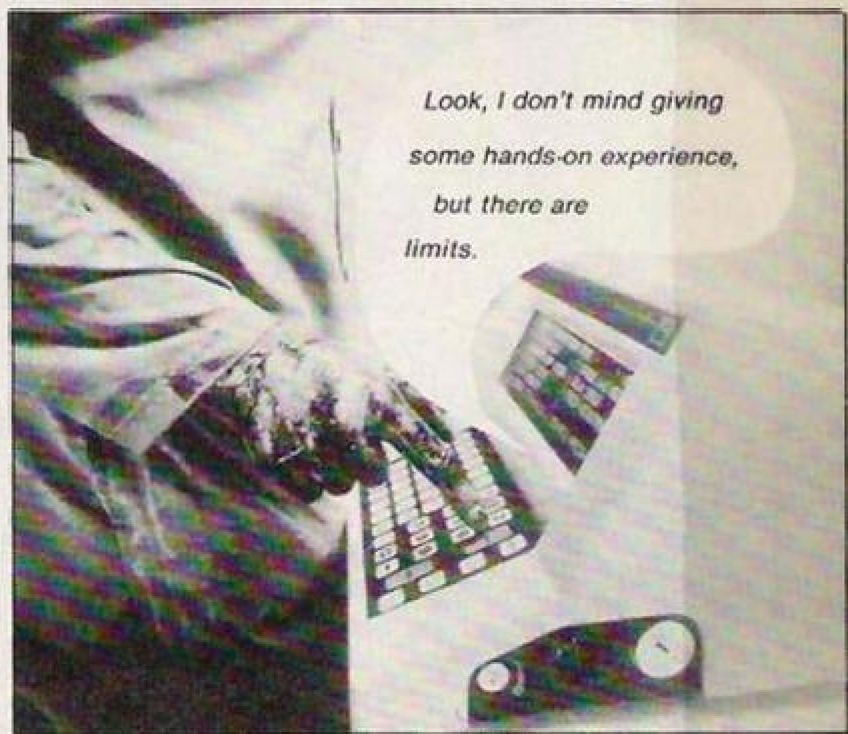
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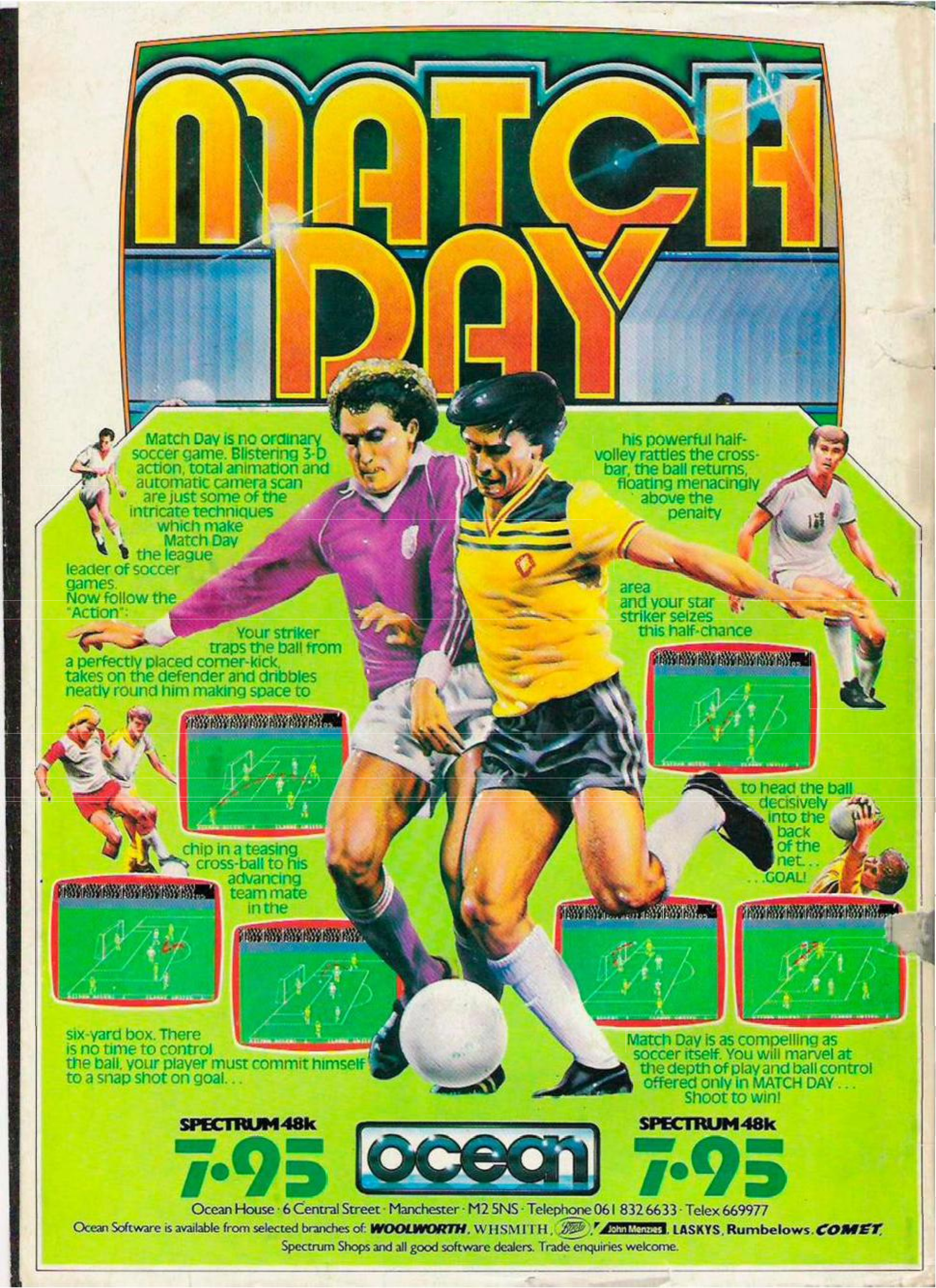
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